FLIGHT

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FLYING OVER VENICE.—Cagno, the chief pilot of the Italian School of Aviation at Pordenone, on his H. Farman, flying over Venice on March 2nd. Immense enthusiasm was evinced at the performance, and the band at the foot of St. Mark's Tower, which is now 78 metres high, played the Royal Italian Hymn in honour of the event. Note the agitation amongst the pigeons round the church spires occasioned by this visit.

THEORY AND PRACTICE.

AGAIN we have had occasion of late to devote a considerable portion of our space to mathematical articles of a kind that we are very fully aware many of our readers have neither the leisure nor the inclination to peruse with the studious attention to detail that is essential to the full appreciation of such subjects. And, therefore we once again attempt to summarise concisely the conclusions that we have thus far evolved concerning the fundamental principles of aerodynamics, at the same time using them to throw light on various practical aspects of flight. We feel thoroughly convinced that all our readers are interested in knowing the gist of such arguments, provided that they can be expressed intelligibly in what is commonly called non-technical language, and also provided that they have a fairly obvious application to the practical design and use of aeroplanes, which is, after all, the test and sole purpose of theory.

Theory should be helpful, not confusing; but the details of theoretical investigation are almost essentially complicated, and we have seldom met anyone who is capable of comparing two different lines of thought with precision except by devoting an immense amount of time to an analysis of comparative methods of treating the same subject. It is for this reason that we have endeavoured to maintain a uniform line of thought throughout the various articles that we have published containing the very aggressive-looking formulæ and equally unattractive diagrams in question. There is a great advantage in doing this, for it means that students of aerodynamics who base their own study on FLIGHT articles will find that they have a common ground for discussion whenever they meet together for that purpose at lectures or other scientific gatherings. Nothing, perhaps, is quite so obstructive to progressive thought as the absence of any clearly defined and well-understood basis by which various results can be compared. It is not so necessary that one should be right in one's theories as that one should be understood by those who pay the compliment of consideration to the arguments advanced, for the more lucid a statement is made the more surely will any fault be visible in its composition. Logic, so abstruse that the average mind is unable to follow it, is apt to remain in realms removed from average utility, despite its potential value. Where these considerations obtain, mutual enlightenment is comparatively easy, and it is often wonderful what a little theory —and very simple theory at that—will serve to clear up a whole multitude of difficulties to a number of people who otherwise remain confused for ever, because they are unable to get a foothold on any one rung of a ladder of thought that is common to all.

It is necessary when dealing with any subject to define accurately and very definitely the hypothesis upon which future arguments are to proceed, and especially is this so in connection with the study of flight, because there are alternative hypotheses that will make the issues diverge from the start. In our study of aerodynamics the chosen hypothesis is summed up in the statement that "an aeroplane is supported in flight by the inertia of the air." This statement can be extended to cover other special cases, as, for instance, that "the thrust of a screw is derived from the inertia of the air," for the blade of a screw is, after all, nothing but an aeroplane in principle, although its conditions of operation are somewhat different. By inertia of the air we mean its resistance to *acceleration*, and by acceleration is meant the state of moving faster and faster and faster. Acceleration must not be confused with velocity, which is merely the state of uniform motion. Even at this point we see a practical application of theory, for the necessity of maintaining the acceleration of the air suggests the necessity of using a cambered plane, inasmuch as a flat inclined plane having a constant angle would not continue to accelerate the air after initial impact, although it might continue to maintain the downward velocity.

In the theoretical considerations put forward in our recent article, "Can we fly faster for less power?" it was shown that the purpose of a cambered plane on the above hypothesis was to deflect downwards a stratum of air. It was further shown that, if the deflection of the stratum coincided with the camber of the plane, calculations to determine the permissible loading for different flight speeds might be based on the angle of deflection represented by the intersection of mean tangents drawn to the entering and trailing edges of the rib of the plane to be used. It was also pointed out that the "*coefficient of flight*," which means the ratio of "lift to drift" "gliding angle," or "amount of thrust required to maintain a unit of load on a unit of area in horizontal flight," varies with the angle of deflection, and that there is one particular angle that gives a lower "coefficient of flight" than any other. The numerical value of this angle depends on the frictional resistance set up between the air and the surfaces of the plane; but excepting certain experimental data on this point established by Zahm in America, the angle of least resistance is about 5°. Detail explanations of how the angle is measured and how calculations are based thereon have been given in the afore-mentioned and other articles. The important point that we wish to emphasise in this summary is the fact that there is an "angle of least resistance," and that such evidence as exists shows the angle in question to be much smaller than anything so far employed in practice. Consequently, if flight speeds are increased so that the camber of the planes can be made flatter, the conditions of flight should be considerably more efficient.

Another very important point related to the above is that the "coefficient of flight" does not vary with speed; in other words, once we have fixed the angle and made the plane, the ratio of thrust to *loading** will remain unchanged, no matter how fast that plane is driven through the air. If it is driven twice as fast as its initial speed the loading will increase four times, but the resistance per unit of area will increase four times also, and the ratio thus remains the same. Needless to say, of course, the total lift is increased four times as well, which, coupled with the doubling of the speed, shows that the initial power must be increased eight times. This brings us to a relationship between power and loading that is of the utmost interest and importance.

If we have a given plane of stated camber and area, and proceed to drive it through the air in horizontal flight, the total lift should be proportional to the two-thirds power of the horse-power applied. Thus, for example, if we double the horse-power we shall obtain 1·6 times the lift. This "two-thirds power" law is worthy of being regarded as one of the great laws of aerodynamics, and it has many useful practical applications. By its aid we can estimate in advance the possible increment in loading that will result from some contemplated change in engine-power, or, *vice versa*; when we want to increase the lift we can estimate the increase in horse-power that will at least be necessary. In connection with experiments the recognition of this law is invaluable, because a curve† plotted to the two-thirds power of the horse-power, with loading for its other co-ordinate, forms a curve of comparison between theory and practical results.

That which has been said of the aeroplane applies in principle to the thrust of a screw propeller and the power applied to the shaft, the increment in thrust being proportional to the two-thirds power of the increment in power applied to the shaft, whether the propeller blade be considered independently as an aeroplane or the propeller as a whole be regarded as a fan creating a uniform slip stream over the entire disc area.

The validity of the two-thirds power law is dependent on the maintenance of the V^2 law of skin friction at all speeds.

Arising out of the foregoing considerations, the first practical deduction is that we should endeavour to fly faster, so that we may use more efficient planes, which deduction carries with it the necessity of designing the framework and body of the machine so as to have the least possible resistance to motion through the air. Then again, the question of flying fast introduces practical difficulties associated with ascent and descent, such as suggests the desirability of having a variable speed machine. Theoretical considerations, indicated above, point out that the proper line of development is to have a machine with variable area, because, assuming that the planes themselves have been made with an angle of least resistance initially, any variation from that angle will be inefficient. On the other hand, it will be remembered that if we increase the flight speed we shall increase

* Loading is the dynamic lift of the planes per unit of area, and must not be confused with the dead load represented by the weight of the machine, pilot, &c., which is a fixed quantity. The loading varies with speed and angle, and its value multiplied by the area of the planes may be greater or less than the dead load. If greater, the machine rises; if less, the machine descends.

† An example of this curve will be found in the March 4th issue.

the loading; consequently, if we desire to maintain horizontal flight at an increased speed, the increased loading must take effect over reduced area, so that the total lift remains unaltered. Loading being proportional to the square of the speed, the area must be reduced to one-quarter of its initial expanse when the flight speed is doubled.

Schemes for varying the area of the planes in flight have been proposed, but none of them are, so far as we know, very satisfactory, and indeed the idea itself immediately gives rise to antagonistic feelings in the heart of the practical engineer, whose mind instinctively realises the enormous possibilities of fatal weakness in mechanisms that are called upon to perform this kind of service. It will be observed from a preceding remark that the variation in area needs to be very considerable if the principle is to be applied in practice over any wide range of speed, and this fact suggests to our minds a possible method of varying area effect that has not so far as we are aware hitherto been suggested. Reverting for a moment to the hypothesis on which these studies are based it is necessary to point out that dynamic support in flight results from deflecting a stratum of air, of which the mass simultaneously under downward acceleration is defined by the span, chord and sweep of the plane.

Of these three dimensions, the span and the chord combined form the area of the plane; while the sweep is the effective depth of the stratum. For the purpose of altering the mass it will obviously serve equally well to modify either one of the effective values of its dimensions. In a biplane the sweep is represented by the gap between the upper and lower plane. Now suppose we had for example a triplane in which the middle plane was so mounted that it could be moved up and down upon the struts and actually brought into contact with, say, the under surface of the upper plane. In this latter condition the machine would have been converted into a biplane of two-thirds the original area of the triplane, and during the intermediate stages the gap between the middle plane and top plane would be gradually throttled and the effective sweep thereby presumably gradually reduced, with an accompanying reduction in the loading value of these two planes combined. The lowest plane of the three would not, presumably, be affected, because the assumption is that its initial gap was made as large as necessary to produce its full lifting value, and consequently any increase in the gap, represented by the upward movement of the middle plane, should not have an important effect in increasing its sweep. Methods of applying the same principle to biplanes can be imagined, but, of course, there are very serious practical difficulties in the way of realising a project of this sort, which we put forward mainly for the purpose of throwing open a basic idea that has not, we believe, previously been suggested.

The serious nature of the practical difficulties attending any scheme for varying area naturally leads one to investigate the pros and cons of varying the angle of the plane. In this connection it is necessary to take into consideration variations in the attitude of the plane, which produce a variable angle of incidence, and variations in the camber which produce a variable angle of deflection. Variations in the angle of incidence could be obtained by pivoting the planes on their leading spar, but fundamental considerations suggest that variation of attitude is an inefficient way of varying the angle. What we really mean by a varying angle is a varying camber of the plane, which would have to be produced by warping the plane along its entire length.

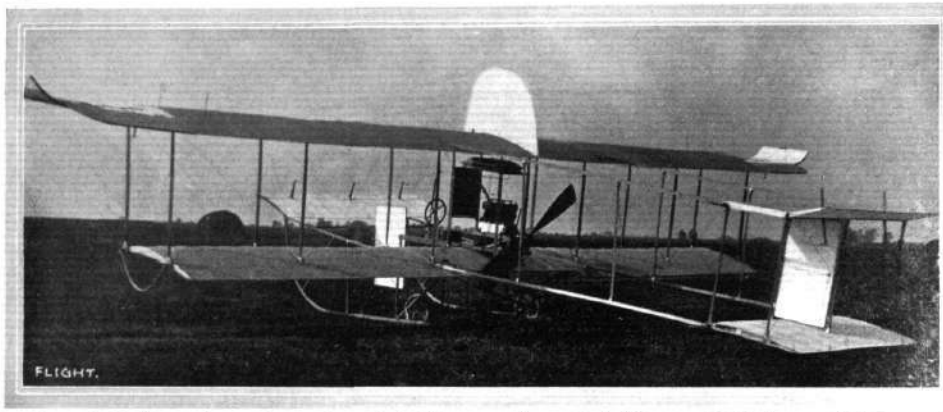
The theoretical considerations affecting the efficiency resulting from any such manœuvre as this are wrapped up in the relationship between the coefficient of flight and the angle of deflection, to which reference has already been made in the early part of this article. It helps to fix ideas if we take a specific case. Let us suppose, for example, that the effective value of the angle of deflection—which we will assume is initially large—has been halved. Halving the effective value of the angle of deflection will obviously halve the loading for the same speed of flight, and thus halve the power for the same speed of flight. Let us further suppose that the initial speed of flight is doubled at the same time that the angle is halved. In doubling the speed we shall obtain four times the loading represented by the smaller angle—that is to say, the loading will be twice its initial value. We are now carrying twice the loading at twice the speed, and thus obviously require four times the initial power; in other words, while the loading has increased in direct proportion to the velocity with a diminishing angle, the power has increased as the square of the velocity, a ratio that is much less efficient than that stated above as the two-thirds-power law. But this disadvantage will not wholly obtain, because when the angle is diminished the coefficient of flight will likewise be diminished, whereas in the preceding deductions it has been assumed that the coefficient of flight—that is to say, the ratio of thrust to the loading—remains unchanged. Now if the coefficient of flight were reduced to one-half at the same time that the effective value of the angle of deflection is reduced to one-half, we shall be able to carry twice the load at a given speed with the smaller angle for the same power; or, for the case under consideration above, we should be able to carry twice the load at twice the speed for twice the power, which implies that we could carry the initial load at twice the speed for the initial power; in other words, that the increase in speed would be proportional to the decrease in the effective value of the angle of deflection, the power remaining the same. The reduction in the coefficient of flight is not directly proportional to the reduction in the angle, however, although a reduction of considerable magnitude does take place and is sufficient to make flight at the higher speed with the smaller angle more efficient than at the slower speed with the higher angle. Both efficiencies, however, will be inferior to that obtaining at all speeds with a plane of least resistance and suitable area.

On first thoughts this variable angle theory always suggests that it is offering something extremely efficient, but in reality this is a delusion, because the fundamental assumption really implies that the angle was initially very inefficient. The true state of affairs, for instance, is best realised by taking an imaginary case comparing the relative advantages of varying speed by diminishing area or diminishing angle. In the case of the diminishing angle the limit is reached when the angle becomes that of least resistance, and assuming that the loading of the plane at the velocity then obtaining is just that required for the support of the total load, then the machine in question is operating under its best conditions. If the angle of the planes is fixed at this point the machine would be under the disadvantage of having to land and rise at this supposedly high flight speed; and if it were really essential to get off the ground at a lower velocity, the only way to do so with the same engine would be to increase the area of the planes, for if an attempt is made to rise by increasing the angle of the planes the coefficient of flight is increased disproportionately to the reduction in speed, and greater power will be required to accomplish the manœuvre successfully. Conversely, therefore, it follows that where there are two machines both capable of ascent at a certain slow speed, the one by virtue of its large area and the other by virtue of its steep angle, either the power of that using the steep angle plane will be greater than that using the large area for the same total load; or, if the engines are the same, then, in the limit, that machine which is capable of reducing its area will be able to fly faster than the other machine which is only capable of reducing its angle.

Practical considerations, it is true, put the variable angle in the more favourable light, because it does not seem to involve such complicated construction. Indeed, it is even possible that the desired effect might be obtained altogether without mechanism by merely making the planes initially flexible, so that increased loading should cause an automatic flattening of the camber during flight, and a corresponding improvement in efficiency. The whole question of efficiency at high speeds is, of course, primarily governed by the question of body resistance, which should be considered as a separate resistance and as an independent factor in the calculations, which must be reduced to a minimum by the use of suitable shapes and casings.

There is still considerable confusion of thought about this question of body resistance, and its very importance often seems to lead investigators to disapprove of the principle of regarding it as an extra. We admit that its magnitude in high speeds is so great as to practically outweigh any other consideration at the moment, but even this does not alter the theory of its relationship to the resistance of the planes. Body resistance has nothing to do with the planes, and the only way to properly understand the theory of the cambered plane is to regard it as a self-contained element devoid of all superstructure and extraneous resistances. The practical applicat on of the theory thus learned to the design of actual machines at once brings body resistance into consideration, and thereby presents a new and entirelydistinct problem for solution,

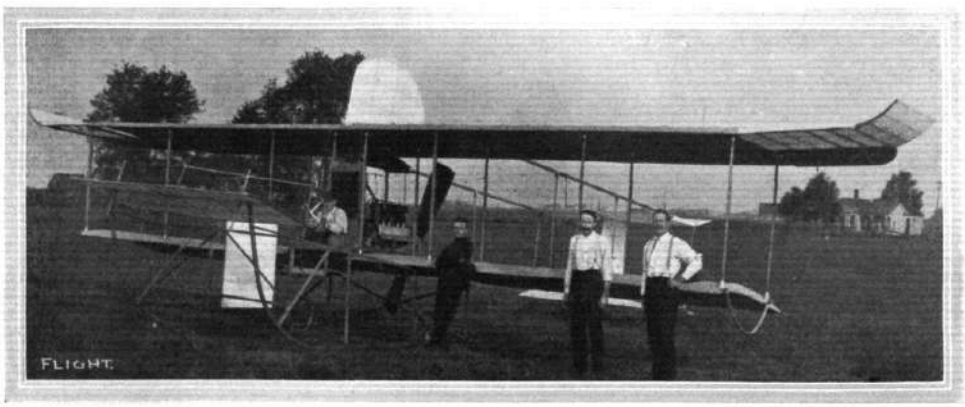
A COAL CITY BIPLANE.



AN interesting set of photographs reaches us from Coal City, Illinois, showing the good aviation work in progress in that district. Mr. William E. Sommerville, who is Mayor of the town and is the builder and pilot of his own machine, sends us at the same time the following interesting description and details :—

"The total area is 510 sq. ft. Total weight, 1,020 lbs. The upper main plane is 45 ft. by 5 ft. The lower 35 ft. by 5 ft. The tail, 8 ft. by 5 ft., is placed 18 ft. back of the trailing edge. The elevator, 3 ft. by 10 ft., is 10 ft. ahead of the leading edge. The engine has 4 cyls., 4-cycle, 5 ins. by 5 ins., developing 40-h.p. at 1,000 revs. per min., propeller 7 ft. by 6 ft. pitch, flying angle 5°. It will be seen from the photos that the top main plane has upturned ends, also a fin placed on top. I have found that the upturned ends and the central fin are sufficient to maintain lateral stability. In calm weather I had no use for the Venetian blind arrangement situated near the extremities of the top plane, but with a breeze the machine rocked a little, so I opened the blind on the high side, and the machine immediately regained an even keel. I am positive, as soon as I get accustomed to being in the air, the blinds will not be required, as the upturned ends and the central fin will maintain lateral stability automatically. During September a few short flights were made, and on October 1st a flight of two miles was made, and the machine flew as if on rails. The flight terminated when the engine went all to pieces. The great difficulty in this country experimenters meet with is in the securing of a reliable engine. I am building an engine myself, and expect to be flying next month. I have also built a monoplane, with upturned ends and central fin, and expect to test it soon. My biplane was built in 1909, but owing to the difficulty of getting an engine same was not tested until late this summer.

"I am sure that a flying machine can be designed that will be automatically stable, and a few improvements on the design shown will accomplish it."



Mr. W. E. Sommerville and his biplane.

THE CHAUVIERE PROPELLER-TESTING PLANT.

IT is generally recognised that static thrust tests of propellers afford data that is of doubtful value as an indication to their operation in flight, and devices for testing propellers in motion have therefore a *prima facie* claim to the interest of our readers. Messrs. Chauviere, whose propellers are so popular, and whose agent in Great Britain is Mr. G. W. Goodchild, of 30–32, Farringdon Road, E.C., have installed the motor car plant for testing their propellers which is illustrated by the accompanying photograph, and is thus described in the *Genie Civil* by Lieut.-Col. Espitallier:—

At the end of the car a strong structure of sufficient height for mounting a propeller of up to 12 ft. diameter is arranged. A chain-drive allows the 70-h.p. motor either to work on the car-shaft or on the propeller-shaft, or on both simultaneously.

In the event of the propeller being of a large diameter, the air-pressure caused by its motion will be sufficient to start the car and to give it a proper speed, which can be increased by driving down hill. Since small-sized propellers are incapable of absorbing all the power developed by the engine, it may be necessary to transmit part of it direct on to the wheels of the car in order to move the car.

Thereafter it is sufficient to record by means of an odograph the speed of the car and simultaneously through other devices the number of revolutions of the propeller-shaft, the pressure of the propeller in the direction of its axis and also the amount of the torque. These latter measurements are the most difficult to make.

For recording the thrust, the propeller-shaft, which is supported in such a way as to allow some slight movement, is resting against a flexible membrane of an apparatus similar to the pressure regulators used especially in steam-heating plants. This diaphragm forms an air-chamber and is held between two discs serving as the abutment for the shaft. It operates by its movement in either direction two valves on a compressed air system.

The thrust of the propeller pushes the membrane inwards and the compressed air enters the chamber until its pressure balances the propeller-thrust. As soon as this condition is achieved, the air supply is cut off.

It is evident, therefore, that the shaft will oscillate slightly about its central position. Moreover, at the moment the thrust is balanced by the pressure of the air it is sufficient to record this pressure by using a manometer.

A similar attachment may be easily applied for recording the torque which tends to move the system of bearings in a direction opposite to that of the propeller. Thus the whole system can oscillate in all directions, which is important in view of the necessity to obtain absolute freedom of motion.

The propeller is actuated by a set of bevel-gears and the main-engine shaft is fitted with a cardan drive; but the outer end of this shaft being necessarily affected by the variations of speed of the forward end, it would not be possible to fix the sprocket wheel for the driving-chain to this shaft. This wheel is, therefore, mounted on an independent hollow shaft which runs in fixed bearings. The shaft with the cardan-joint passes through this tube and is rotated by means of a special flexible coupling.

It was also foreseen that the variations in the speed of the car and the jolts, caused by the irregularity of the road, would cause shocks to the shaft that might influence the diaphragm in such a way as to make the readings of the pressure-gauge unreliable. In order to overcome this, a counterweight equivalent to that of the propeller and the parts which rotate in connection therewith has been provided, and this counterweight moves in the opposite direction.

LIST OF NEW PILOT AVIATORS (FRANCE).

Name.	Country.	Date of Birth.	Where Born.	Machine	Qualified.	No.
Bonzon (Maurice)	Fr.	15 Au., 90	Lyons	H. Far.	3 Fe., 11	355
Bergognié (Charles)	,,	22 Se., 81	Maisons-Laffitte	Som.	,,	373
Benoist (Jean)	,,	10 Se., 91	Bugeaud (Alg.)	Modified Vois	,,	369
Boillot (Geo.)	,,	3 Au., 84	Valentigney	Han.	,,	395
Cei (Joseph)	It.	25 Ja., 89	Cascina	Cau.	,,	353
Carles (Fernand)	Fr.	11 Fe., 86	Marseilles	Som.	,,	362
Contour (Ernest)	,,	19 Se., 83	Semur	,,	,,	371
Chaussier (Pierre)	,,	24 Ma., 76	Douai	Breg.	,,	384
Chevillard (Maurice)	,,	25 Au., 87	Courteray	Han.	,,	388
Collardeau (Geo.)	,,	22 Ap., 86	Bordeaux	Modified Far.	,,	393
Chaunac-Lanzac (de)	,,	23 Ju., 72	Champcevreuil	R.E.P.	—	394
Delagrange (Robert)	,,	26 Jy., 70	Orleans	Han.	3 Fe., 11	366
Deroye (François)	,,	26 Jy., 84	Arnay-le-Duc	H. Far.	,,	374
Deruissy (André)	,,	7 De., 83	Laventie	Breg.	,,	376
Denis (Auguste)	,,	30 No., 76	Etin	Koe.	,,	380
Frantz (Joseph)	,,	7 Au., 90	Beaujeu	,,	,,	363
Fiorellimo (Louis)	,,	14 Jy., 83	Nice	Ant.	,,	369
Frugier (Leon)	,,	22 My., 79	Villebois	H. Far.	,,	378
Goys de Mereyrac (Louis)	,,	23 Ap., 76	Lyons	Bl.	,,	354
Grandseigne (Robert)	,,	25 Se., 85	Havre	Cau.	,,	360
Grellet (Alexis)	,,	7 Ma., 74	St. Etienne	Bl.	,,	370
Gouguenheim (Pierre)	,,	19 Ap., 92	Paris	H. Far.	,,	388
Gasnier (Pierre)	,,	16 Se., 76	Bouchemain	Bl.	,,	391
Gassier (Marcel)	,,	3 Ja., 74	Marseilles	Modified Far.	,,	392
Gonx (Jules)	Fr.	6 Ap., 83	Valentigney	Han.	3 Fe., 11	398
Grailly (Jacques)	,,	27 Se., 84	Poitiers	,,	,,	399
Hamel (Gustav)	Eng.	25 Jn., 89	London	Mor.	,,	358
Houlette (André)	Fr.	26 Jn., 84	Paris	Han.	,,	367
Hanriot (René)	,,	12 Jn., 67	Vaite	,,	,,	368
Kergariou (Edgard de)	,,	26 De., 84	Paris	Bl.	,,	372
Leyat (Marcel)	,,	26 Ma., 85	Die	Som.	,,	364
Lenfant (Louis)	,,	30 Ap., 76	St. Dizier	Han.	,,	386
Magneval (Gabriel)	,,	4 De., 70	Marseilles	Som.	,,	359
Martin (Edouard)	,,	3 Ja., 78	Paris	,,	,,	363
Magnan (Leon)	,,	1 Ju., 79	Marseilles	H. Far.	,,	379
Nissole (Edouard)	,,	22 Oc., 74	Loulans-les-Forges	Tel.	,,	383
Osmont (Geo.)	,,	7 Fe., 74	Paris	H. Far.	,,	361
Ors (Jean)	,,	12 Ja., 76	St. André-du-Bois	Bl.	,,	382
Palade (Antoine)	,,	1 Jy., 86	Montpellier	Sav.	,,	387
Pommier (Marin)	,,	24 Ma., 74	Luché-Pringé	Nieu.	,,	400
Raoult (Jean)	,,	9 Jy., 76	St. Malo	Bl.	,,	356
Reimbert (Ernest)	,,	26 My., 79	Paris	Som.	,,	375
Reichert (Henri)	,,	20 My., 86	Abbeville	Sav.	,,	377
Rivollier (Jean)	,,	25 Ja., 83	Aix-les-Bains	Bl.	,,	361
Renaud de la Fregeolière	,,	29 Ap., 86	Angers	Han.	,,	396
Tixier (Henri)	,,	8 Ma., 87	Nancay	,,	,,	397
Verrier (Pierre)	,,	18 Ma., 90	St. Lactencin	Modified Vois	,,	390
Weston (Maximillian)	Af.	17 Ju., 74	Zululand	H. Far.	,,	357

Country—Af. = Africa; Eng. = England; Fr. = France; It. = Italy.
Machine.—Ant. = Antoinette; Bl. = Blériot; Breg. = Bregnet; Cau. = Caudron; Han. = Hanriot; H. Far = Henry Farman; Koe. = Koechlin; Mor. = Morane; Nieu. = Nieuport; R.E.P. = R. Esnault-Pelterie; Sav. = Savary; Som. = Sommer; Tel. = Tellier; Vois. = Voisin.

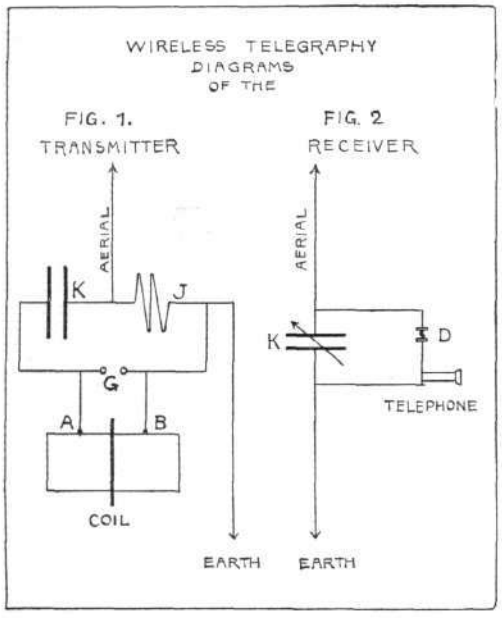
WIRELESS TELEGRAPHY AND FLIGHT.

By T. THORNE BAKER.

A GOOD deal of attention is now being devoted to the practical question of wireless telegraphy from aeroplanes and airships. The problem is one that is necessarily divided into two sections, since so much more difficulty is experienced in dealing with the aeroplane than with the airship. The advantage of being able to communicate with land or other stations when flying has already been well exemplified in the case of the Wellmann flight, while the advantages of a military aeroplane scout being able to send messages to his army are obvious, and demand serious attention.

The airship is easy to deal with on account of the comparatively large amount of weight it is able to take up. The electrical energy for the wireless apparatus can be supplied either from accumulators or from a small generator, and in either case, the greater the weight admissible, the more the energy available for the wireless plant.

The real difficulty is experienced when one comes to deal with the aeroplane, where weight is of far more consequence. A long aerial wire, for transmitting the wireless energy, is a



sine quâ non where long distances are to be covered, and a dependent wire of considerable length does not present any trouble in the case of the airship.

Many experiments have been carried out with long aerial wires trailing behind an aeroplane, and distances of a few miles have been covered; the first experiments were done on Mr. McCurdy's aeroplane in the States, and in this case one very long wire was employed, and the steel wires of the machine itself were used as a "counter-capacity." Mr. Farman has obtained good results on his biplane by using two long trailing wires, the wireless signals being successfully communicated over several miles. In all wireless systems an electrical oscillation is set up which requires two wires, or one wire and something equivalent in the way of a capacity. The earth is invariably used for the equivalent capacity in all stations except ship stations, where the hull of the vessel, if of iron, is employed. The idea of employing the network of wires on the aeroplane is impracticable, since it becomes "alive," and might give serious shocks to the pilot or passenger. Hence two long wires appear to be the simplest solution of the problem; but trailing wires present dangers in many ways to a machine travelling at a high speed through the air, which all pilots will recognise.

The first experiments carried out in this country were made by me, with the assistance of the *Daily Mirror*, during the Army Manœuvres at Salisbury in 1910. Recognising the extreme aversion with which the average pilot regarded any loose wires, I designed a wireless transmitter based on the Hertz principle of two balanced aerials, the effective length of which was greatly increased by means of an auto-transformer which formed part of the spark-gap shunt circuit and part of the aerials themselves. One aerial wire was fixed each side, going from the nose of the machine to the extreme edge of the main plane, and thence back to the tail, the total length being about 50 ft., or in the case of the Bristol military aeroplane with extended planes, 65 ft.

The experiments were quite successful, but the distance over which this apparatus was tested was only about a mile, owing to the fact that the weather prevented the pilot from flying a greater distance. A Bristol biplane was lent for the original experiments, and I am now carrying out some further ones on a more extensive scale in conjunction with the British and Colonial Aeroplane Company. I have adopted two entirely new plans on this occasion, which I hope to describe fully in a later issue, and from the tests carried out on my experimental ground at Cricklewood there appears to be a likelihood of some successful results being obtained.

There is very little chance of a pilot ever being able to *receive* a message on an aeroplane, owing to the feeble character of the signals received. The most successful wireless receivers are all based on the sensitiveness of the telephone, in which a faint buzz is heard when oscillations are set up in the receiving circuit by the effect of a wireless signal on the detector. The Marconi magnetic and valve detectors are both extremely sensitive, and some of the newer crystal detectors are perhaps even more sensitive to the short waves produced by aerials of limited length, but it would probably be quite impossible to hear them with the noise of the engine a foot or two away. The only possible solution that seems to present itself is a small electric lamp arranged with a coherer, which would glow with each signal received, but it would necessitate the devising of a relay which would be unaffected by the vibration of the machine.

The principle on which signals are transmitted by wireless telegraphy will be seen readily with the help of a simple diagram (Fig. 1). Here an induction coil is shown, of which A, B, are the terminals of the secondary. Two wires lead from A and B to two small metal balls, G, across which the spark takes place; shunted across this spark-gap is a Leyden jar or set of jars, K, and a few large turns of thick wire forming an inductance, J. From one end of the inductance coil a wire leads to an earth plate or water-pipe, &c., and to the other is attached a long aerial wire. The longer this aerial wire is, other things being equal, the greater is the radiating power of the transmitter. Whenever a key is pressed completing the primary circuit of the coil, intense sparks pass between the spark balls, and an electrical oscillation is set up along the aerial wire which radiates the energy outwards in all directions; neglecting the inductance, J, the length of the radiated wave is between four and five times the length of the aerial wire. Short waves are quickly damped out, hence the drawback of the aeroplane; an aerial 300 ft. and upwards in length is desirable, even for short-distance work, whereas the greatest length of *fixed* wire admissible on the wide military biplane of the British and Colonial Aeroplane Company, is only about 65 ft. A second wire of equivalent capacity is also necessary to take the place of "earth."

Only a comparatively small percentage of the amount of the primary energy is actually radiated by the aerial, and the waves travel outwards in practically all directions, just as little waves travel outwards in a circle when a stone is dropped into water. It will therefore be seen how delicate the receiving apparatus must be to detect a weak signal, and inversely, how powerful the transmitting apparatus should be, especially where a short aerial is employed.

The receiving apparatus in its simplest form will be seen diagrammatically in Fig. 2. The aerial and "earth" are connected to a variable tuning condenser, K, and also to a detector, D, and a telephone, T, these two being in series. The detector I used in the portable receiving set designed for military aeroplane work consists of two spring copper clips mounted on a small ebonite base, between which a crystal of silicon or some other mineral is fixed. It

s a "bad contact" detector, and when a signal is picked up by the aerial, an electric oscillation takes place in the circuit which affects the conductivity in the dectector, and a buzz is heard in the telephone. The Marconi Company have produced some excellent detectors which are very suitable for the purpose also.

A very large number of elaborations are introduced in actual practice, which enable one to get the receiver and transmitter into tune with each other, all these tending to increase the efficiency of any wireless system. It is interesting to observe that the aerial wires in the experiments made on aeroplanes with *short aerials*, where each wire is stretched between the nose, outer edge of the main plane, and tail of the machine, thus forming a sort of C, produce distinctly directional effects. According to Mr. Simeon, a Marconi engineer who assisted me in some joint experiments at Shorncliffe recently, the signals could only be heard when the aeroplane was in a certain direction relative to the receiving antenna. This trouble will, I hope, be quite overcome with the new apparatus which is to be tested at Salisbury.

AERONAUTICS IN PARLIAMENT.

ON Tuesday some interesting official information was forthcoming in the House of Commons from the Secretary for War in response to inquiries by Mr. Burgoyne. What Mr. Burgoyne wanted to know was how many dirigibles were complete, building, or ordered for the French, German and Russian Armies; how many aeroplanes had been built, purchased, or on order for those Governments; what was the amount of financial provision made for aeronautical work in France, Germany and Russia during the last two years; how many officers and men had been or were being trained for aeronautical work in this country; what the cost of their pay and upkeep was estimated to reach during the coming financial year; whether the money necessary to meet these charges would be borne by the vote for the Air Battalion of the forces; and whether a special course of training in connection with aeronautical work had been decided upon; and, if so, over what period of time this training was likely to extend.

In reply Mr. Haldane gave the following facts. The German Army has nine complete dirigibles, but no official information as to further orders is available. The French Army has four dirigibles complete and eight in various stages of construction. The Russian Army has nine dirigibles complete, one building, and four on order. As regards aeroplanes, no definite information is available as to Germany, as that Government has adopted a policy of subsidy in respect of them. As regards France, nearly seventy aeroplanes are in possession of the Government, but as to further orders no information is to hand. As regards Russia, it is understood that ten aeroplanes are available for use, and that twenty are on order.

The figures as to financial provision for aeronautical work are as follow:—

Germany.

1909.	Expenditure	£54,231
1910.	Estimate	£400,000

(including Zeppelin Subscription Fund, £305,000).

France.

1909.	Expenditure	£108,500
1910.	Expenditure	£126,650

These figures include pay of *personnel*, &c., upkeep of laboratory, depôts, &c.

Russia.

1909.	Estimate	£103,020
1910.	Estimate	£183,820

With regard to training for aeronautical work, 9 officers and 108 non-commissioned officers and men who are trained, or are in course of training, are now with the Air Battalion at Aldershot. There are also a number of officers of Royal Engineers and men who have been trained in captive ballooning and kiting. The establishment of the Air Battalion consists of 14 officers and 176 other ranks, and their pay and upkeep for the year 1911–12 will amount to about £20,000, which is provided under the several votes concerned.

The training of officers and men in aeronautical work is proceeding. No definite duration of course has yet been fixed, but officers joining are placed on probation for six months.

German Army and Aviation.

FROM Berlin it is announced that the Minister of War has decided to send to the Doebritz Camp some fifty or sixty officers of various branches of the service, who will undergo a course of instruction in aviation. These officers will be chosen from the unmarried lieutenants, and, their instruction terminated, they will return to their Corps with the exception of a few, who will compete for the ten positions as Aviation Instructors to the Army. The Minister of War has asked the Reichstag to approve of funds for the payment of a special allowance of 200 marks per month to the officers sent to Doebritz. It is the intention of the military authorities to arrange for an aviation section at all the garrisons which have parade grounds attached to them.

American Army and Aeronautics.

THE United States Senate have now passed a Bill authorising the sum of £25,000 to be spent on aeronautics in connection with the Army, and £5,000 has been made immediately available. The U.S. Navy will not benefit directly by this vote, but a sum of £5,000 is included in the Navy estimates and it is hoped that this will also be passed.

The Weiss monoplane in flight at Brooklands under the pilotage of Mr. Eric England last Saturday.

The Royal Aero Club of the United Kingdom

OFFICIAL NOTICES TO MEMBERS

Annual General Meeting.

The Annual General Meeting of the Members of the Royal Aero Club of the United Kingdom will be held on Thursday March 30th, 1911, at 5 o'clock, at 166, Piccadilly, London, W.

Committee.

In accordance with the rules, the Committee shall consist of eighteen members. Members are elected to serve for two years, half the Committee retiring annually. Retiring members are eligible for re-election.

The retiring members of the Committee are :—

Griffith Brewer	Prof. A. K. Huntington
Major C. de W. Crookshank, R.E.	F. K. McClean
John Dunville	C. F. Pollock
Capt. A. H. W. Grubb, D.S.O., R.E.	Stanley Spooner
Col. H. C. L. Holden, R.A., F.R.S.	

Capt. A. H. W. Grubb, D.S.O., R.E., does not offer himself for re-election.

Any two members of the Club can nominate a member to serve on the Committee, having previously obtained such member's consent. The name of such member so nominated, with the names of his proposer and seconder, must be sent to the Secretary in writing not less than fourteen days before the annual general meeting. Wednesday, March 15th (first post), is the last day for the receipt of nominations.

The following members have so far been nominated :—

Lieut. B. H. Barrington-Kennett	*F. K. McClean
*Griffith Brewer	A. Ogilvie
G. B. Cockburn	Mervyn O'Gorman
*Major C. de W. Crookshank, R.E.	*C. F. Pollock
*John Dunville	*Stanley Spooner
*Col. H. C. L. Holden, R.A., F.R.S.	G. Holt Thomas
	Sir George White, Bart.
*Prof. A. K. Huntington	Howard T. Wright

* The names marked with an asterisk are those of members of the present Committee.

Members are reminded that a ballot paper for the election of nine candidates to seats on the Committee of the Club will be forwarded to them at least seven days before the date of the annual general meeting.

Committee Meeting.

A meeting of the Committee was held on Tuesday, the 7th inst., when there were present :—Mr. R. W. Wallace, K.C., in the chair, Mr. Griffith Brewer, Mr. Ernest C. Bucknall, Col. H. C. L. Holden, R.A., F.R.S., Prof. A. K. Huntington, Mr. V. Ker-Seymer, Mr. J. T. C. Moore-Brabazon, Mr. C. F. Pollock, Mr. Stanley Spooner, and Harold E. Perrin, Secretary.

New Members.—The following members were elected :—
Charles Reginald Abbott, Hector Douglas Munro.

European Circuit.

The representatives of the Royal Aero Club (V. Ker-Seymer, M. O'Gorman and H. E. Perrin) attended a Conference in Paris on Friday, March 3rd, 1911, at which the rules governing the European Circuit were drawn up. The various prizes put up in Paris, Germany, Belgium, Holland and England in connection with the competition will amount to over £16,000. The contest will start from Paris on June 5th, 1911, and the competitors are expected to reach England shortly after June 24th, 1911. The arrangements as regards England will be carried out by the Royal Aero Club, and the full regulations will be issued in about 10 days time.

International Aero Exhibition at Olympia.

The International Aero Exhibition, held by the Society of Motor Manufacturers and Traders under the auspices of the Royal Aero Club, will open on Friday, March 24th, and terminate on Saturday, April 1st, 1911.

In connection with this Exhibition, a section for models will be organised by the Royal Aero Club, assisted by the Aviation Section of the Automobile Association and Motor Union. Prizes, amounting in all to £50, are offered, and the judges will take into consideration practicability, originality of design, and excellence of construction. Full particulars can be obtained from the Secretary, Royal Aero Club, 166, Piccadilly, London, W.

Members of the Royal Aero Club will be admitted free on production of their membership cards.

A room in the Princes' Gallery will be placed at the disposal of the members during the Exhibition.

Gordon-Bennett Aviation Cup.

The following countries have entered for the Gordon-Bennett Aviation Cup :—

America.	France.	Great Britain.
Austria.	Germany.	

Each country will be represented by three competitors. The contest will be held on Wednesday, June 28th, 1911, and the Committee of the Royal Aero Club will make their final decision as to the course within the next few days.

In order to give as much time as possible, the Royal Aero Club has extended the date of entry for the British competitors to May 1st, 1911. Intending competitors are requested to notify the Secretary of the Royal Aero Club on or before that date, of their willingness to compete, if chosen. Entries must be accompanied by a remittance of £20, which amount will be returned should the entrant not be selected.

Mr. R. C. Fenwick, of Liverpool, has sent in his entry.

Presentation of Clock.

Mr. C. Grahame-White has kindly presented a handsome clock for the members' room as showing his appreciation of the assistance the Club has rendered him during the past year.

Library.

Mr. A. P. Thurston has kindly presented his book "Elementary Aeronautics" to the Library of the Royal Aero Club, and Mr. C. Grahame-White has kindly loaned the Club a souvenir volume of the Harvard Aviation Meeting.

HAROLD E. PERRIN.
166, Piccadilly. Secretary.

PROGRESS OF FLIGHT ABOUT THE COUNTRY.

NOTE.—Addresses, temporary or permanent, follow in each case the names of the clubs, where communications of our readers can be addressed direct to the Secretary. We would ask Club Secretaries in future to see that the notes regarding their Clubs reach the Editor of FLIGHT, 44, St. Martin's Lane, London, W.C., by first post Tuesday at latest.

Aldershot Model Aero Club (116, VICTORIA ROAD).

MR. S. F. CODY is giving the club his lecture, "From Kites to Aeroplanes," on Wednesday, 15th inst., at the Tin Hall, Victoria Road, and it is hoped that the meeting will prove very successful. The club have been very fortunate in having a glider (Farman type) presented to them by a gentleman in the district. This machine is not quite finished, but when it is the members will have the opportunity of practising gliding, as the use of a field with a nice gradual slope has also been granted. The hon. sec. would be pleased to hear from anybody interested in aviation in the district.

Birmingham Aero Club (165, HAMPTON STREET).

THE second annual exhibition organised by this club is to be held at Bournville on April 17th and 18th, and will be of unusual importance. At the moment there are signs of an awakened interest in aviation in the Midlands, and this club is anxious to foster the feeling by an extensive exhibition of aeroplanes, gliders, models, and everything accessory to things aeronautical. Every encouragement will be given to those commercially interested in finding a market for their manufactures.

As the club do not enter into possession of their own ground in time for this event, the actual flying will be confined to man-carrying gliders and models. For model flyers the two chief events will be the amateur and open championships of England. There are some fourteen classes, and between £30 and £40 in prizes to be competed for. The hon. sec. will be glad to send particulars on receipt of stamp.

Clapham Aero Club.

IN spite of the inclement weather which prevailed on Saturday last, a very successful competition was held on Wimbledon Common, the prize being awarded to the competitor whose model showed the best all round qualitities. Marks were given for duration, distance, steering, and stability. The competition resulted as follows :—1st,

T. Tiduwry, "Alwin" monoplane; 2nd, Leslie H. Harris, Hirondelleplane No. 30; 3rd, J. Dollittle, "Gnat" monoplane.

The "Alwin" monoplane performed many fine flights during the course of the afternoon, and was remarkable for its stability and speed. Leslie Harris's "Hirondelleplane," his thirtieth successful type after many years of model aeroplane construction, was a good second. It soared into the air and reached a great height, and then glided gracefully to earth. The flight of the "Gnat" monoplane was little short of phenomenal in respect of its swiftness and steadiness. Other members' models are to be highly commended. Weather permitting, a one-ounce competition will be held on Clapham Common to-day, Saturday.

Conisborough and District Model Ae. Soc. (18, CHURCH ST.).

ON account of the rain no flying took place on Saturday last. A meeting was held in the evening, when it was decided to set one night apart every week to be called the members' weekly social night. The object is for mutual benefit, so that any member may attend on that night with a certainty of finding other members in the club room to discuss their different ideas.

It was decided to open a list to receive nominations for the new committee and officers to be elected at the annual general meeting to be held on May 3rd, 1911. The committee is to be increased by two for the ensuing year, which will make eight, including the officers.

Kite and Model Aeroplane Assoc. (27, VICTORY RD., WIMBLEDON)

THE next lecture will take place on Thursday, March 16th, at 8 p.m., at the offices of the Aeronautical Society of Great Britain, when Mr. A. Cousin will lecture upon "Aerial Gunnery Illustrated," followed by a descriptive illustrated exhibition of slides showing Mr. A. V. Roe's experiments with models and full size machines from 1905 onwards. Any reader wishing to attend should apply to the hon. sec. for tickets.

A good programme is being arranged for the year in the way of competitions, and the hon. sec. will be pleased to receive applications for membership from any reader at once—subscription, 5s.; youths under 17, 2s. 6d. The great success of Mr. S. F. Cody's lecture, and the interest shown by the 530 present, has resulted in Mr. Akehurst arranging another lecture, which will be given at an early date in April, and on this occasion it will be illustrated by animated pictures.

Scottish Ae.S.(Model Aero Section) (3, STANMORE RD., GLASGOW)

A MODEL flying meeting of the above club was held at Victoria Park, Whiteinch, on Saturday, 4th inst., and proved quite a success, notwithstanding the rather windy weather. About a dozen members with models took part, and gave a good display. Most of the models came to grief early on account of the gusty wind, but flights of a very satisfactory nature, although more circular than straight, were obtained, particularly by Mr. Donaldson and Mr. Kerr. It is the intention of the club to hold meetings every fortnight in open spaces at different parts of the city. The next meeting will be held in Queen's Park, and members are requested to meet at the gate of same on Saturday, March 18th, at 3.30 p.m. Non-members interested in models are cordially invited to the meetings. Particulars of same can be had from R. M. Glenesk, 200, North Street, Glasgow.

BRITISH NOTES OF THE WEEK.

Royal Patronage for Olympia.

FOLLOWING the precedent established by the late King Edward VII, His Majesty King George V has graciously extended his patronage to the Aero and Motor Boat Exhibition which opens at Olympia on the 24th inst., and closes on April 1st.

Models at Olympia.

AT the previous Shows of aeroplanes held at Olympia a very interesting section has always been the display of models, and there is no doubt that the forthcoming Exhibition, which opens on the 24th inst., will prove no exception to this rule. Already a large number of entries have been received by the Royal Aero Club, and model-makers who desire to secure space should send in their application at once in order to avoid disappointment. Each application should be accompanied by a fee of 10s., and the exhibits will be eligible for substantial cash prizes which are being offered by the Royal Aero Club and the Aviation Section of the Automobile Association and Motor Union. There is no doubt that the system of giving cash prizes, instead of the usual medals, will be welcomed by model-makers in general.

Mr. Morison Flies at Brighton.

REPAIRS having been completed to his Blériot monoplane, Mr. Morison determined to take advantage of a break in the weather on Tuesday, and indulged in a flight of 12 mins. over the sea at Brighton, greatly to the enjoyment of the large number of spectators who assembled to witness the flight. Rising from the Lawns, at Hove, Mr. Morison rapidly attained a considerable height, and then turning seaward steered out into the bay for some distance. There he carried out a number of evolutions and flew over the two piers, eventually landing on the ground at Shoreham which it is proposed to convert into an aerodrome.

Mr. Paterson at Freshfield.

ACCOMPANIED by a passenger, Mr. C. Compton Paterson made a very good flight from Freshfield to New Brighton and back on Sunday afternoon. Arriving at New Brighton the aeroplane was piloted over the Perch Rock Battery and the pier and proceeded along the promenade as far as Egremont Ferry. There a turn was made for the Tower, after circling which the aviators returned to the shore where they landed in front of the Marine Hotel. After only a brief stay the machine once more rose in the air and returned to its headquarters at Freshfield.

The Blackburn Monoplane at Filey.

ALTHOUGH the machine was somewhat damaged in the end, very fair success was attained on Tuesday during some trials over Filey Sands with the Blackburn monoplane. With Mr. Hucks in the pilot's seat, the machine was run for a distance of three miles along the sand, just to see that everything was in order. Then, on the elevator-lever being moved, the monoplane took the air, and rising to a height of about 30 ft. headed for Filey Brigg, the speed being about 30 m.p.h. Unfortunately, in making a turn, the machine swooped, and one wing caught the ground, bringing the machine down, damaging the chassis.

University College Lectures.

HALF the course of lectures delivered by Mr. Archibald R. Low has been completed and has been devoted to estab-

The Olympia flying girl poster which will help to attract the usual crowds to the Aero Show of the S.M.M.T. and Royal Aero Club, opening on March 24th.

lishing the principles and formulæ used in actual calculations of frames, surfaces and propellers.

In the laboratory, specimen stanchions, wires and strainers have been exhaustively tested. In the drawing office, calculations have been made of stresses in important members by means of the funicular polygon, and a propeller has been drawn out in accordance with the methods of Drzwiecki, modified by the lecturer.

The remainder of the course will consist entirely of calculations of head resistance, aerodynamical reaction, weight, thrust and stability.

Invention *versus* Achievement.

IN our leading article of last week we perhaps failed to make it perfectly clear that the use of the term "contemptible prize-snatchers" was *not* made by "British Brains" either in a published or unpublished letter, but was quoted by us from the communication of quite another of the numerous correspondents whose views were not deemed by us to be of sufficient general interest to be accorded the hospitality of our columns. Very naturally "British Brains" desires us to state that no such words have ever been used by him and that he entirely dissents from the sentiment they contain.

Another Blériot for Brooklands.

ONE of the latest aeroplanes to arrive at Brooklands is a single-seater Blériot monoplane, which has just been sold by Messrs. Blériot, Ltd., of Long Acre, to Mr. V. Hewitt, who has hitherto met with considerable success on a Cross-Channel type Blériot, and anticipates doing even better on this latest type machine. It is similar to that recently sold by Messrs. Blériot, Ltd., to Mr. O. C. Morison, whose epoch-making flight to Brighton will not soon be forgotten.

British E.N.V. Engines for Russia.

NOT only British aeroplanes, but also British-built flight engines are finding a market in Russia. The E.N.V. Company have now further opened business in that country, in which they sold the first of their engines some time ago. It should be noted that a new type of E.N.V. motor is being built which will be on view at Olympia.

Huntingdon as a Flying Centre.

MR. J. HARTE HOPE, the principal of Hope, Hartope and Co., of London and Leicester, has, we learn, taken Portholme, adjoining Huntingdon Station, for aviation purposes. Every effort is now to be made to make Huntingdon an important flying centre, and apart from the manufacture of aeroplanes, a flying school is to be established and sheds will be available on easy terms.

Flights for Coronation Day.

FURTHER in regard to our paragraph last week, Messrs. Keith Prowse and Co., Ltd., inform us that they are fast booking up demonstration flights for the Coronation Day, and other dates throughout this year, and it is important that syndicates or sports committees should write them at once to 38, Berners Street, W., for terms and conditions.

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FROM THE BRITISH FLYING GROUNDS.

Brooklands Aerodrome.

WEDNESDAY last week saw a change for the better in the weather, and not before it was wanted. In all directions active work was in progress. Early in the morning Mr. Pixton, on the Avroplane, made several short flights. At mid-day the Molesworth triplane came out and made some quite good hops in a very puffy wind, but the machine came to grief owing to the wheels not being strong enough. The machine was turning on the ground when the outside wheel on the right-hand side buckled, pitching her forward and breaking one plane, a skid and the propeller.

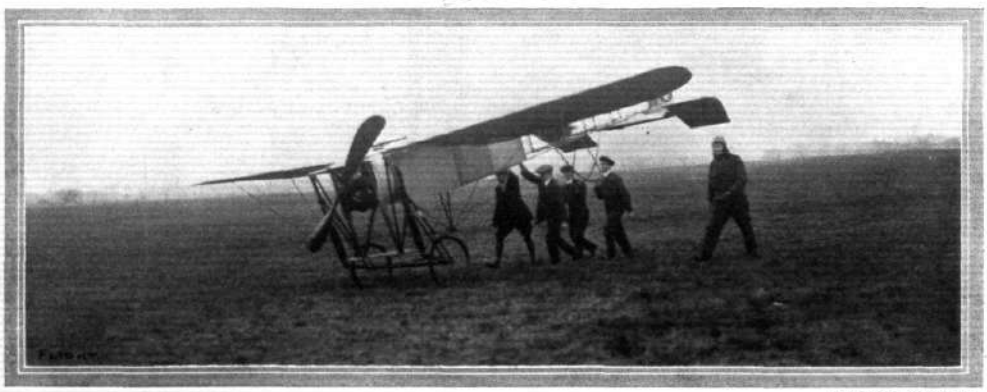
Mr. Pixton and Mr. A. V. Roe, on the Avroplane, which seems to be very steady in a wind, were also making straight flights. Macfie was tuning up his new machine, but found that the balance was not good, so contented himself with straight flights. Mr. Gordon-England, on the Weiss, was also making some straight lines, the stability of the machine having been much improved by alterations to the body.

Mr. Pixton was on Thursday again first out, with several good flights in trying a new propeller which had been fitted. About five o'clock Mr. Macfie was up, making some flights in a puffy 20-m.p.h. wind. In the hands of Mr. Gordon-England the Weiss rose quickly with a good pulling engine to a height of 30 ft. Suddenly she dropped, landing heavily, pitching forward, this being due to a severe down-draught. Under the stress the skids were not up to their work, and broke off short, the machine turning over on its back with Mr. Gordon-England inside. Fortunately he was quite unhurt.

Friday was again windy, and it was not until nearly six that anybody ventured out. Mr. Pixton on the Avroplane then covered one circuit and landed. He was just starting out again, and was turning on the ground, apparently so quickly that the body broke off just behind the pilot's seat.

On Saturday morning it was fine, but the afternoon was spoilt by a fine rain. Mr. Macfie was out, but his machine was not up to the mark; Mr. Pixton put up a few flights on the Avroplane, Mr. Persjo, on the Hanriot, was making straight flights, but the engine did not like the damp air. Just before dark M. Ducrocq rose from the aerodrome and carried Mr. Colin Campbell, of Natal, as passenger.

With a light breeze blowing so steadily that it troubled no one, and a warm sun, Sunday proved a glorious day. There was a good attendance of the public and flying was general. M. Ducrocq, Mr. Watkins, and Mr. Spencer were all out, at times. Mr. Pixton took the Avroplane up to over 800 feet, and remained in flight for 25 minutes, later on repeating this performance. Mr. Blondeau and Mr. Snowden-Smith were also flying for some time, whilst Mr. Persjo, on the Hanriot, amongst other trips, steered round behind the sheds and over the sewage farm. Mr. Dolphin, of India, a new pupil, had his first lesson on the Hanriot, and was indulged in a couple of short flights. Mr. Hamel, using



"Flight" Copyright.

Hamel (to the right) bringing in a Grahame-White School Blériot after a cross-country flight from the London Aerodrome at Hendon.

ENTERPRISE IS TO BE ADMIRED IN EVERY FORM.—Messrs. Campbell-Gray, Ltd., the photographers, send us the above picture showing how anybody, flyer or prospective flyer, can be photographed in a real aeroplane at their establishment. The machine is one which has done some flying, and was recently purchased by them for this very up-to-date purpose.

Mr. Sopwith's Howard Wright, was in the air several times. If the present influx of the public is any indication of what one is to expect in the summer it looks as if one of the most popular "shows" of the season will be at Brooklands. The Committee will have to find some means to keep the people off the ground, as at present it is inclined to be hazardous to both the people and the aviators. Mr. Astley, who had never before flown a two-seater, put in some particularly successful work on "Big Bat."

Monday was fine and calm in the morning, but some rain fell in the afternoon. Mr. Kemp was out on the Avroplane in the morning practising *vols plané*. Mr. Sopwith was up in spite of the rain. He afterwards had a turn with the Howard Wright monoplane, but the engine was not running up to its form. Mr. Watkins took Capt. Maitland for a short trip, but did not remain up long as he found it none too easy to see in the rain.

On Tuesday Sopwith and Ducrocq were the only two who were doing any flying.

Laffan's Plain.

SEVERAL days last week Mr. Cody devoted exclusively to kite flying and glider experiments. Major Sir Alexander Bannerman, who paid a visit to the hangar on Thursday, showed particular interest in this branch of aeronautics.

On Monday, the appearance of the Farman Army aeroplane was the event. After a few short flights on Farnborough Common the machine was conveyed to Laffan's Plain, where several successful straight short flights were accomplished, varying from 50 to 300 yards, at an altitude of from 20 to 35 ft. The morning's work was brought to a close through a slight accident, the breaking of one of the skids, caused by a dip of about 6 or 8 inches in the ground.

Mr. Cody was also flying, and the two machines were frequently in the air at the same time; at one time Mr. Cody followed closely up behind the Farman in the backwash from the latter's propeller, a condition which had no perceptible effect on his machine.

Mr. Cody made two passenger flights—the first that he has undertaken for a monetary consideration—the proceeds being handed over to a local church fund.

London Aerodrome, Collindale Avenue, Hendon.

Blériot School.—The week opened badly, Monday and Tuesday being very windy, and although on Wednesday it was still windy Mr. Prier took the new School machine out for a trial, flying several circuits. He also gave an exhibition of his skill and clever handling of the Blériot monoplane for the benefit of a cinematograph operator.

On Friday afternoon, taking advantage of a comparative calm, Messrs. Champion, Keeler, and Henderson in turn took charge of the helm of one of the School machines, and indulged in some rolling practice, but the wind proved troublesome, and they experienced some difficulty in steering a straight course, so the work for the day came to an end.

Saturday was once again a blank day.

On Monday morning several of the pupils were out on the School machines, showing marked progress.

Mr. Hamel's Blériot 50-h.p. Gnome arrived this week from Issy, and Mr. Hamel, who is taking up his quarters at the Blériot School, will continue to practise on the Hendon ground, and probably take a hand in the Hendon-Brooklands prize on Saturday, weather permitting. Another Blériot 50-h.p. Gnome of the latest pattern is also expected next Tuesday.

Grahame-White School.—It seemed rather a paradox that the the month of March should open with a day free from the wind that had been raging almost incessantly for the previous three weeks. The staff pilots were not at all slow in their appreciation of the lull, as soon after ten o'clock Hubert wheeled out the school Gnome-Farman and put in a good flight of half an hour's duration, during which time he mounted to an altitude of over 500 ft. Greswell's Gnome-Blériot, which had undergone overhauling operations during the bad weather, was the next to appear, and after a preliminary engine test he got away. Quickly spiraling up to an altitude of over 1,000 ft., he made wide circuits of the aerodrome, indulging in short excursions over the surrounding country. After a flight of 45 mins. duration he descended *en vol plané*.

While both Hubert and Greswell were in the air together, Martin got away on the "New Baby" racer, the three making an imposing spectacle as they flew round the ground at different altitudes. The "New Baby" now shows considerably better form since a larger diameter propeller was fitted. Her "get-off" now is quite as smart as that of the Gnome-Blériot. Martin covered three complete circuits, but was compelled to come to earth on the fourth owing to engine trouble.

Flying was not on the bill on Thursday, owing to the wind and fine rain.

Friday the 3rd was more favourable, and Greswell was the first to start, he flying the Gnome-Farman for the first time for several weeks. The wind was still strong enough to render things none too pleasant for the aviator, but notwithstanding this, Martin took a turn after Greswell's descent, making a short solo flight. On landing, Ridley-Prentice, a pupil, took his place in the passenger-seat, and the two were soon away, flying six circuits at at average height of 50 ft. On coming to earth, a gust apparently caught the machine, and it landed rather more forcibly than was intended. Nothing seemed to break, until the machine pulled up and then the front four chassis struts gave out, letting the front part down and lifting the tail high in the air.

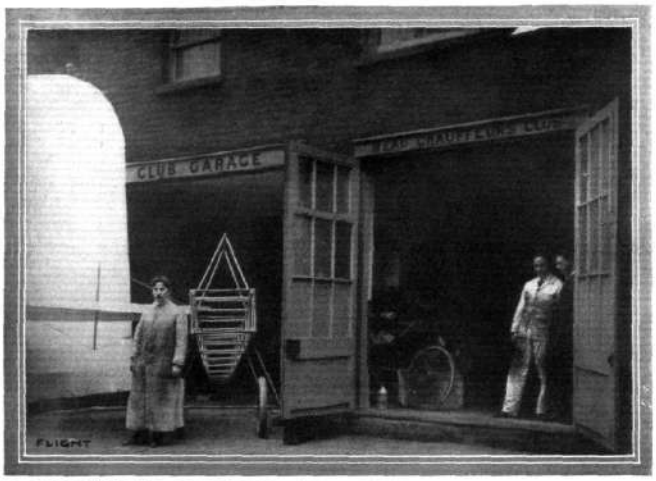
M. Prier, the clever Blériot School instructor at the London Aerodrome, Hendon, and on the right M. C. L. A. Hubert, who is the second Frenchman to obtain his pilot-aviator's certificate in England.

Excepting the four struts and a smashed elevator no damage was done. On Saturday a large crowd collected in anticipation of seeing competition flying for the prize offered for the Brooklands-Hendon return flight. The wind and the rain that fell later in the day unfortunately prevented any flights taking place, and the crowd had to content themselves with a tour of the hangars.

Sunday was an ideal day for flying, and it was a great disappointment that neither Greswell or Hubert were present to contribute to the day's operations. At 3 o'clock Martin came out on the "New Baby" and made a good flight of four circuits. On landing he complained that the engine was not running at its full power. After a few adjustments he started again, and this time she mounted rapidly, climbing to a height of 300 ft. After his third lap he came down *en vol plané* opposite the sheds, but unfortunately he evidently misjudged his distance, as he pulled the machine on to a level keel some 20 ft. off the ground. Losing speed, the machine fell backwards on to the left wing, breaking the rear boom and one strut. It says something for the design and construction of the landing-chassis that it was not in any way damaged by its 20-ft. fall.

Monday was a satisfactory day for flying, and early in the afternoon Greswell brought out the Gnome-Blériot, and was soon at an altitude of 750 ft. Keeping up for half-an-hour, he flew in large circles outside the aerodrome, descending eventually *en von plané*.

M. Chanter, a new arrival, brought out his Anzani-Blériot and made several short flights.



A CHAUFFEUR BUILDING AN AEROPLANE IN HIS SPARE TIME.—Mr. C. Favre working on an aeroplane of his own design at the Head Chauffeurs' Club of Great Britain and Ireland. In the next "shop" Mr. Ainsworth, another chauffeur, is building a car to his own design.

Salisbury Plain.

THE windy and rainy weather of last week rendered flying out of the question, but on Sunday, the first fine day for nearly three weeks, advantage was taken of the break in the weather by M. Tetard, who brought out the E.N.V. Bristol No, 19, and made a good trial round Fargo Camp, Stonehenge, and the Downs, finishing with a fine gliding flight. The aviator then changed over to a Gnome-engined Bristol, and took Versepuy as a passenger for a trip. He finished up the day's work by treating some of his mechanics to a jaunt in the central blue. Several new pupils have arrived at the Bristol school, M. Tetard being very busy giving lessons, and taking pupils for trial flights.

Monday morning was also fine, although a little misty, and M. Tetard was out early and giving lessons up till ten o'clock, when rain came on and stopped operations until the afternoon. Then he brought out the Gnome-engined Bristol biplane, and flying with Mr. Herbert Thomas as passenger, was soon up to a height of 1,500 ft. After doing a circle of about four miles they went off across country in the direction of Salisbury. Soon after passing over Amesbury they got completely lost, for a quarter of an hour seeing nothing at all. They then mounted to a height of 2,000 feet, as it was thought better to get above the clouds than stay in them. Soon, however, the clouds rolled away and they found themselves over Amesbury village. They then made for the sheds and returned together after an excellent flight.

Several of the pupils were afterwards taken for lengthy trips on another machine. The steady rain on Tuesday morning precluded any flying until the afternoon when M. Tetard was out flying over Amesbury, Bulford, Durrington, Netheravon, and Niter Downs at a height of 2,000 ft., from which he glided down at the conclusion. Mr. Low then got into the machine and went round Fargo Camp, coming down with a fine *vol plané*. Later M. Tetard was giving instructions to pupils, while Mr. Low brought out the Bristol monoplane. The engine developed mulish tactics, and so the machine did not get off the ground.

AIRSHIP NEWS.

"City of Cardiff" at Watford.

THE inhabitants of Watford and the vicinity had a fine view of Mr. E. T. Willows' airship "City of Cardiff" on Sunday afternoon, when it was cruising in the neighbourhood for just on an hour. A temporary garage has been erected alongside the Bushey Hall Road, in connection with the United Service Tournament, and this Mr. Willows has made his temporary headquarters. In response to numerous requests he has made arrangements for carrying out several flights with passengers.

New Airship Station at Cologne.

AN endeavour is being made by the municipal authorities at Cologne to induce the German Ministry of War to consider the question of establishing an airship station at Cologne. Should the idea materialise, the station will be located outside the fortifications and will be marked in some way to render it easily visible from vessels in the air. The new Zeppelin dirigible is to be stationed at Cologne at the beginning of October.

A Self-Contained Airship.

AN extraordinary airship is being built by the Toliver Aerial Navigation Company at San Diego, California. It is of the rigid type and 250 ft. in length, while the diameter is 40 ft. It will be of the usual cigar shape, but will be distinguished by the fact that the cabins, which are to hold forty passengers, will be arranged within a circumference of the airship, while observations will be carried on by means of conning towers. The steering and elevation of the airship will be controlled entirely by propellers, of which there are six, two at either side and one at each end, mounted on flexible shafts working through ball and socket joints, to enable them to be turned in any position. The builders hope to launch the airship in about two months' time.

DEATH OF MAURICE GUFFROY.

THE ranks of French aviators have sustained a grievous loss by the death of M. Maurice Guffroy, who has passed away, on the 3rd inst., in French Guiana as a result of illness contracted in that country during a visit in connection with his business. M. Guffroy had for many years taken an active interest in aeronautics, and in 1901 was one of the first to receive the balloon pilot's certificate of the Aero Club of France. With the development of aviation he turned his attention to that branch of the science and was the first—other than M. Esnault-Pelterie himself—to meet with success in piloting the R.E.P. monoplane, with which he made several very fine flights.

FOREIGN AVIATION NEWS.

The Sommer Monoplane.

DURING the past few days Leon Bathiat has been making extensive trials with the two-seated Sommer monoplane and during one trial flight on Saturday he stopped the motor at a height of 300 metres and landed in a space 10 metres square which he had marked on the ground before ascending. While testing a two-seated military type biplane on Sunday, Molla was obliged to land at Villers owing to his petrol pipe breaking. On hearing of this predicament, Bathiat set off on his monoplane with a new petrol pipe, and landed close to Molla's disabled machine. After effecting the necessary repairs the two returned to Douzy in company.

Activity at Juvisy.

SUNDAY was a typically busy day at Juvisy. Ladougne on his Goupy biplane was flying for an hour, and Pischoff was up for a considerable time at a height of about 100 metres, while Landron, also on a Pischoff monoplane, remained in the air for an hour or more with passengers. Among others who were doing good work were Gondard on a new monoplane, and Jourdan, who took up several passengers. On the previous day a Roumanian military officer, Brumarescu, made several rounds of the course, while Gasnier was testing "Le Sylphe" monoplane.

Deperdussin Monoplanes at Rheims.

THE exploits of Vidart and Busson on their Deperdussin monoplanes attracted large crowds to the Betheny flying grounds on Sunday afternoon. Three times Vidart flew off to Rheims and doubled the Cathedral spire, while Busson was kept busy satisfying the demand for passenger trips. At 6 o'clock Busson, accompanied by the Swiss aviator François Durafour, rose to a height of 600 metres in 8 mins. and headed off for Rheims closely followed by Vidart on a second machine. On returning Busson made a splendid *vol plané*, landing just in front of his hangar. On the previous day Busson, on a military type Deperdussin, accompanied by Vidart, flew from Mourmelon to their headquarters just by Rheims.

Breguet at Douai.

ON Saturday afternoon, although a strong wind was blowing, Breguet indulged in a lengthy flight on his biplane at Douai. On the following day he gave a first lesson to six new pupils and then went for a cross-country trip with three passengers on board, a speed of just on 100 k.p.h. being attained.

Sommer Biplanes at Nevers.

AT Daillen's Aerodrome near Nevers, on Sunday afternoon, Visseaux was flying for an hour over the country with Lanier and Michel, Lanier afterwards flying by himself for 5 mins. on the Sommer biplane.

R.E.P. Monoplanes at Buc.

SOME good flying was seen on Sunday afternoon at Buc, where Pierre Marie on his R.E.P. monoplane made several impressive and spectacular flights, each concluding by a gliding flight from a good height. Capt. Chaunac made a lengthy flight on a military R.E.P., while Laurens made a half hour's trial flight with the monoplane built for Russia. Bresson was also testing a two-seated R.E.P. and made a cross-country trip with it. On the previous afternoon Capt. Chaunac made an excursion in the direction of St. Cyr on the military R.E.P.

Morin Above Toulouse.

AT Toulouse on Sunday afternoon Morin made four flights on his Blériot machine, the total duration being 1 hour. In the course of one of these flights, he flew over the city and environs of Toulouse at an altitude of 1,350 metres and thereby gained a prize offered locally for this exploit.

Busy Scenes at Issy.

THE calmer weather which has prevailed at Issy during the past few days has induced many of the pilots to make up for lost time. Colliex on the new Voisin has been busy carrying passengers, while Anzani has been making extended tests with his latest three-cyl. motor fitted to his Blériot monoplane. Mdlle. Trany, on her Vinet monoplane, was also making steady progress, as also were the Blériot pupils Sallard, Darioli, Pepitte, and the Russian Capt. Remmert, while several Caudron pupils of the C.I.N.A. School have been putting in considerable work. Parent, on his biplane, and Kaufmann, on his monoplane, have also met with marked success with their machines.

New Farman Machines.

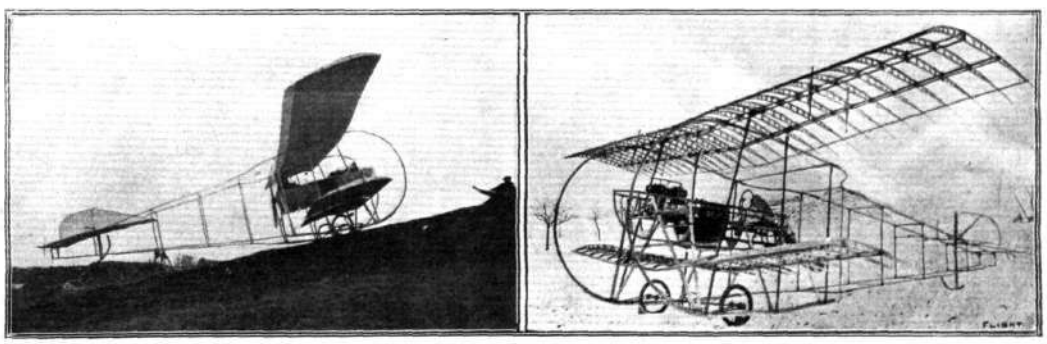
TAKING advantage of a spell of fine weather, Mr. Henry Farman was busy testing a new machine for Grahame-White on Saturday afternoon and also a biplane fitted with a 100-h.p. engine, ordered by Wynmalen. At the same time Louis Dufour was testing several military machines.

A Cup for Military Aviators.

A FINE cup has been placed at the disposal of the Aero Club of France by M. David Bishop, which will be awarded to the officer who during thirty consecutive days in the course of the current year covers the greatest number of kilometres, either in a closed or an open circuit. The minimum distance to qualify is 500 kiloms. Flights may be made across country, but in that case the aviator must indicate beforehand his landing places and the distance will be reckoned from point to point, no distance to be less than 25 kiloms. All flights must be made in a two-seated aeroplane, and the pilot, who must be on active service, must be accompanied by another officer also on active service.

Two Goupys Flying Across Country.

A REMARKABLE little trip was carried out on the 6th inst. by Ladougne and Bobba on their Goupy machines, the latter being accompanied by a passenger. Leaving Juvisy at half past eight, they landed at Buc 12 mins. later. From there they set off at 10 mins. past ten and in less than a quarter of an hour had landed at Issy. Two hours later they made a fresh start and within a few minutes had safely landed at Juvisy again. Both the aeroplanes were of the



A "ONE AND A HALF DECKER" CONSTRUCTED AT THE GERMAN MOTOR SCHOOL AT MAINZ—
The top plane measures 10 metres and the lower one 7 metres.

same dimensions, although the one piloted by Ladougne was of the military type.

Labouchere Flies to St. Cyr.

THE Zodiac Company having decided to transfer their flying school from Issy to St. Cyr, the pilot Labouchere resolved to fly over to the new quarters. Leaving Issy at 20 mins. past five on Monday afternoon, he landed safely at St. Cyr 20 mins. later.

Paulhan's School at St. Cyr.

ON Monday afternoon M. Seguin and several other well-known aeronautical engineers paid a visit to the Paulhan School at St. Cyr and witnessed several demonstration trips by Paulhan, after which Caille proceeded with lessons to several of the pupils, including Ramet, Berge, Ruby, &c. Among other flyers at the ground are Tabuteau and Frey, who have each purchased one of these machines and are making good progress in their manipulation.

A Party of Five Across Country.

ON the morning of the 3rd inst. Capt. Bellenger decided to make his attempt to fly back to Paris from Pau, and four other military aviators there, Lieuts. Malherbe, Princeteau, DeRose, and Conneau, set out to accompany him. After travelling only a short distance, however, Capt. Bellenger had trouble with his motor and returned to Pau, but his four companions, all on Blériot machines, decided to push on, although a dense fog made it very difficult for them to find their way. All four eventually reached the neighbourhood of Libourne, Lieut. Conneau being the first to arrive, landing safely on the military parade ground. He was followed half an hour later by Lieut. Malherbe, who had had to stop at Prechac owing to a downpour of rain. During the afternoon Lieut. De Rose, who had landed on the outskirts of Libourne, flew over to the military ground, while Lieut. Princeteau descended at Mont de Marsan. Later in the afternoon the two officers, Conneau and Malherbe, were flying over Libourne, and on the following day the same two in company went on to Bordeaux, where they landed at the Croix d'Hins Aerodrome, the journey taking about 40 minutes. Two days later they continued their way to Biarritz, passing by Arcachon, and accomplishing the trip in 2 hrs. 5 mins. They were to have started again for Pau on Tuesday morning.

A Long Flight at Pau.

ON the last day of February Lieut. Princeteau was successful in making a very fine cross-country journey in the neighbourhood of Pau on his Blériot machine. Leaving the Blériot aerodrome he went off in a northerly direction, and turning to the east after passing Aire returned to his starting point *via* Tarbes, having been in the air for 2 hrs. 55 mins. and covering a distance of 250 kiloms.

Vedrines Flies from Pau to Toulouse.

MOUNTING his Morane monoplane on Sunday morning, Vedrines set off at 9 o'clock with Toulouse as his destination. He had only been travelling 18 mins. however, when a heavy snowstorm so obscured the country that he deemed it expedient to come down at Tarbes. At 20 mins. to 2 the weather having bettered, Vedrines set off again, eventually landing in the military ground at Toulouse at 3 o'clock. His net flying time for the full distance of 210 kiloms. from Pau to Toulouse shows that his speed must have been close on 120 kiloms. per hour. Immediately after arriving, Vedrines re-ascended to a height of 1,500 metres from which he glided down to the ground again.

On Tuesday afternoon both Morin and Vedrines were flying over the town, and the latter repeated his exploit of rising to 1,500 metres and coming down by a *vol plané*.

The Prix des Amendes.

IT appears that after all Cei's flight did not qualify him for the fifth "Prix des Amendes." This was secured on Sunday at Juvisy by Bobba on his Goupy biplane, his winning flight being twenty-two circuits of the course, equal to 55 kiloms. in 43 mins.

Low Rent for German Aerodrome.

THE people of Hamburg have approved, practically unanimously, an arrangement made by the Senate giving the Aviation Society the use of a flying ground, 45 hectares in extent, at Gross Borstel, for a nominal annual rent of 3 marks on the condition that the Society erects sheds for both aeroplanes and dirigibles. The townspeople will also be responsible for fencing in the ground and for making a good road to it, the cost of which is estimated at 119,550 marks.

Cagno Flies Over Venice.

USING the Farman biplane belonging to the Pordenone School, Cagno, on the afternoon of the 2nd inst., flew over Venice, passing close by St. Mark's Cathedral, and after making a wide circle over the city at a height of 300 metres returned to his starting point. Disturbed from their accustomed calm by the unusual visit, the pigeons of St. Mark's were vastly agitated and swooped round the Cathedral towers by way of protest.

The Pope Watches an Aeroplane in Flight.

AT last His Holiness the Pope has witnessed an aeroplane in the air, for during an exhibition flight made by Fischer he flew round the Cupola of St. Peter's and then returned to his starting point 2 miles outside the city gates. The Pope was able to see the aviator from the window of his library, which overlooks St. Peter's Square, and is stated to have expressed his pleasure at having had an opportunity of seeing an aeroplane in the air.

Austria and the Gordon-Bennett Cup.

Two of the three machines entered by the Austrian Aeronautic Commission for the Gordon-Bennett Aviation Trophy, will be Etrich monoplanes piloted by Illner and Flesch respectively, while the third representative of Austria will be Warchalowski on a biplane of the Farman type.

In connection with the memorial which is being erected to the memory of Otto Lilienthal at Gross Lichterfelde, near Berlin, a medal has been designed by Herr Alb. M. Wolff. The obverse gives a striking portrait of Lilienthal, while on the reverse side Death is depicted leading the aviator, who is making a last appeal to a bird in flight, to the portals of the tomb.

The Russian Aeronautical Exhibition.

THE British section at the Russian Aeronautical Exhibition to be held at St. Petersburg from April 23rd to 30th, promises to be an important one, as the British and Colonial Aeroplane Co., Ltd., have already determined to show their Bristol biplanes. There are still a few spaces vacant, we understand, and applications for these should be sent, before the 14th inst., to Mr. J. W. Riedel, 96, Queen Street, London, E.C., who will be pleased to supply full particulars regarding the Exhibition.

Bouvier in Tunis.

AT the racecourse of Rassar Said, near Tunis, Bouvier on Monday made several good flights on his Sommer biplane, and in one of them he passed over the city. The public were immensely interested in the performances, and on his landing, by a very fine *vol plané*, they carried him shoulder-high to the Grand Stand.

RENAUX WINS THE MICHELIN PUY DE DOME PRIZE.

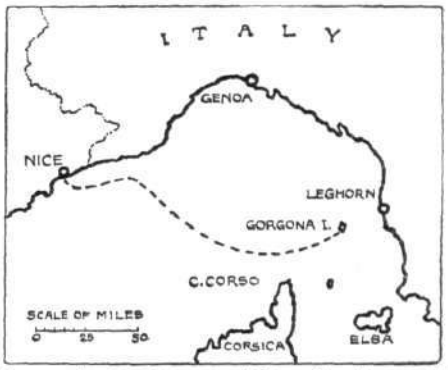
AFTER being open for just on three years, the £4,000 prize offered by M. Michelin for a passenger flight from Paris to the top of the Puy de Dome has been won. The conditions imposed called for considerable daring, and M. Michelin himself, as noted in recent issues of FLIGHT, seems to have come to the conclusion that they might lead to an aviator taking unnecessary risks in order to secure the prize. Fortunately, however, as it has turned out, the winning flight has been made almost without incident. For some time M. Eugene Renaux has been practising on a Maurice Farman biplane at Buc, with a view to annexing the reward. On Tuesday morning, conditions being specially favourable, he determined to take his chance. Accompanied by M. Senouque, M. Renaux made his start from Buc at five minutes to nine, making direct for St. Cloud, the official starting point. Having there crossed the imaginary starting line, he headed south, and passing over Issy continued on by way of Montargis and Cosne to Nevers, where a stop of a quarter of an hour was made at the Peuplier aerodrome for replenishment. On re-starting the aviators steered for Moulins and so on to St. Pouscain and Gannat. At 2h. 23m. 20s., to be precise, the aeroplane landed on the restricted plateau at the top of the Puy de Dome, 1,600 metres (4,813 feet) high, having first circled round the Cathedral Tower at Clermont-Ferrand, in accordance with the requirements of the regulations. All traffic and business in the town was stopped as the aeroplane approached near its goal, and the spectators waited with breathless excitement until the landing had been safely effected when unrestricted enthusiasm was indulged in. The aeroplane was timed to cross the ground of the Aero Club of France at 9h. 12m. 34s., so that it will be seen that the time for the trip of 350 kiloms. was 5h. 20m. 46s., while the maximum time allowed under the regulations was 6 hours. It is interesting to note some of the times at which various points were passed. For instance, the aviators were sighted at Juvisy at 9.28, Montargis, where the machine caught up and passed an express train, at 10.18, Gien at 10.58, while Nevers was reached at 11.53.

The restart took place at 12h. 7m. 37s., and Moulins was passed at 1.20. It will be remembered that only two previous attempts have been made to win this prize, one by Weymann, who lost his way, and the other by the brothers Morane, who met with a serious accident.

A 140 MILES OVER-SEA FLIGHT.

ALTHOUGH the first serious attempt to fly from Nice to Corsica did not terminate successfully, inasmuch as the aviator did not actually reach his destination, Lieut. Bague's grand and plucky flight from Nice to the Island of Gorgona, near Leghorn, is an event of great historical moment. This journey over the sea of 140 miles was, it must be noted, actually more than the distance between the two points which he set out to bridge. Without making any special preparations in regard to boats to rescue him in case of trouble, &c., Lieut. Bague, at 8 a.m. on Sunday morning last, took his departure from Nice on his Gnome-Blériot machine with the intention of reaching Ajaccio, in Corsica, and thereby securing the prize offered for a flight from Nice to that town, a distance of 100 miles. Very shortly after leaving Nice, however, he lost his bearings, and, in the hope of striking the coast again, he kept bearing to the left, as indicated in the little sketch map which we publish. In this way he missed his destination entirely, and on sighting the Island of Gorgona at about noon determined to land and find out where he was. The Island does not present any desirable landing points, and although he endeavoured to make a choice, the one which the officer eventually selected resulted in the chassis of his machine being badly damaged in the landing. No harm fortunately came to him, and the repairs will not take a great time to put right locally.

Hitherto the record for an overseas flight was McCurdy's 100 miles from Key West to Havana, made on January 30th.



Sketch map showing the course of Lieut. Bague's remarkable overseas flight on Sunday last from Nice to Gorgona Island—about 140 miles as the crow flies—where he landed, after losing his bearings in the mist, instead of at Corsica.

TWO NEW PASSENGER-CARRYING RECORDS.

Breguet Breaks Two Passenger Biplane Records.

ANOTHER passenger speed record was broken on Monday by M. Breguet, who, at Douai, on a R.E.P. engined Breguet biplane, carrying two passengers besides himself, succeeded in covering 100 kiloms. in 1h. 15m. 17⅘s. the speed being 79·2 kiloms an hour. The 50 kiloms. were completed in 38 mins. 37⅖ secs., which beats the old record of 52 mins. 56⅕ secs. made by Mamet on his Blériot, at Rheims. The passengers accompanying M. Louis Breguet were Lieut. Peralda and M. Boland, and the combined weight of the three persons was 225 kilogs.

Passenger Speed Record Beaten.

USING a monoplane of his own design, fitted with a 50-h.p. Gnome engine, Nieuport accomplished a splendid performance on Monday by handsomely beating the passenger speed record. Accompanied by his friend, Paul Leprince, he succeeded in flying, at Mourmelon, 100 kiloms. in 58 mins. 10 secs. and 150 kiloms. in 1h. 28m. 37⅘s., while in the hour 101·25 kiloms. were traversed. The new records are as follows:—

kils.		m.	s.	kils.		m.	s.	kils.		h.	m.	s.
10	...	5	58½	60	...	35	33⅗	110	...	1	5	12⅘
20	...	11	54⅘	70	...	41	30⅘	120	...	1	11	5⅘
30	...	17	53⅕	80	...	47	26⅘	130	...	1	16	56⅘
40	...	23	57⅘	90	...	53	18	140	...	1	22	45⅗
50	...	29	38⅗	100	...	58	10	150	...	1	28	37⅘

Another Aerodrome in Algeria.

FOR some time a flying school has been in active operation in the neighbourhood of Algiers, but now a branch of the Bonnet Labranche School has been established at Oran. It was opened by the Governor on the last day of February, in the presence of the Mayor of Oran and many other local civil and military notabilities. Unfortunately a violent wind precluded any attempt at flight being made by M. Bonnet Labranche, but he was able to make up for this on subsequent days and the instruction of various pupils is now in full swing.

Aeroplanes in Madagascar.

THE two aeroplanes which M. Pequie, Governor-General of Madagascar, asked the Ligue Nationale Aerienne to purchase for him have now been taken over by Capt. Glandu and they will be despatched to Tananarivo on the 25th inst. Raoult, who has undergone a course of instruction in the manipulation of them, will also go out with them to act as pilot and to start a school for which one of the machines will be used, while the other it is proposed shall carry the mails between Tananarivo and Fianarantsoa.

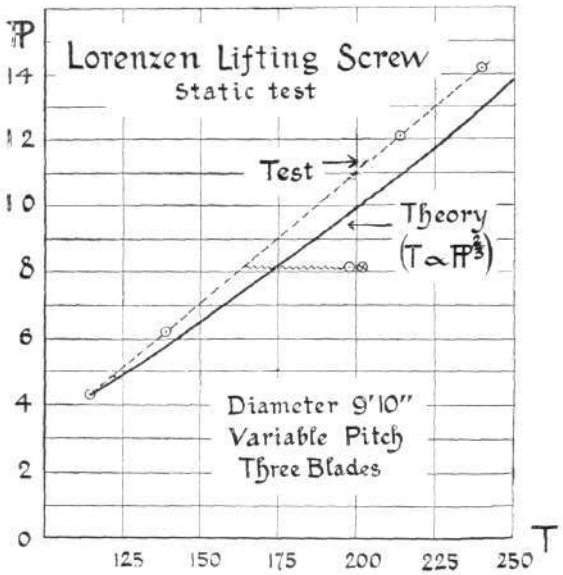
THE PROBLEM OF THE HELICOPTER.

TESTS OF THE LORENZEN SCREW.

IF there is one point more than another that we have endeavoured to emphasise in our articles dealing with this problem it is the advisability of making preliminary investigations on the actual static thrust or lift available from the screws of the type that it is intended to employ. Theory is all very well in its way and most decidedly useful as a means of indicating in advance the nature of the results that may be expected, but a little practical data is invaluable even at the earliest stage of the proceedings because it gives some indication of the degree to which actual results are likely to approximate to theoretical anticipations. Very seldom does theory overestimate the possibilities of practice, but whether it does or not it is only by comparison with practice that estimates can be prepared with any degree of accuracy. It is, therefore, with somewhat more than ordinary interest that we regard the rather meagre information afforded by a set of tests conducted by Faraday House for Mr. C. Lorenzen, who is one of the enthusiastic believers of the helicopter as a future flying machine. Mr. Lorenzen's special line of development is the variable pitch screw and it is a propeller of this type that he has had tested.

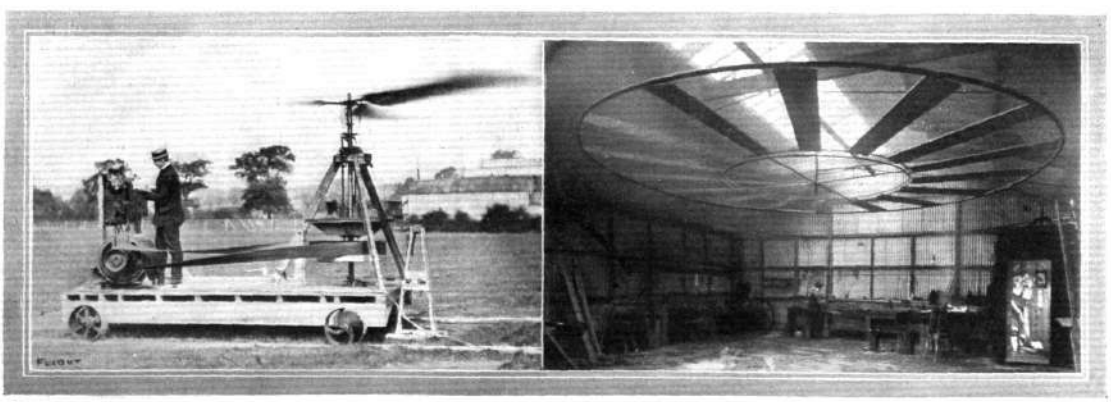
The screw in question measures 9 ft. 10 ins. in diameter and the data obtained from the official test are given herewith in tabular form and also graphically. The figures in themselves are rather meagre, as we remarked above, but we have endeavoured to elaborate them on our own account with a view to drawing a few deductions. The tabulated matter gives the results of tests on two different screws, but only those relating to the smaller propeller were obtained from an official trial by Faraday House. It will be observed that the main feature of the test consisted in increasing the horse-power applied to the shaft. The testing plant, which involved the use of an electric motor and a belt drive, is illustrated by an accompanying photograph, and another photograph shows a very large propeller constructed on Mr. Lorenzen's principle.

In order to better appreciate the nature of the figures obtained from the Faraday House test we have prepared a chart comparing the actual results with theory as represented by the graph of the two-thirds power law, the application of which to this purpose has already been explained in a special article. The vertical scale of the diagram indicates horse-power and the lower scale thrust, or rather lift, seeing that the screw was arranged that way. The full line graph represents the two-thirds power law, whereby the thrust should vary as the two-thirds power of the horse-power and the dotted line shows how it actually did vary in the trial. The two-thirds power curve applies of course to fixed angle blades and it is important to remember that the Lorenzen screw has a variable pitch. Starting at the lowest test in which a horse-power of 4·3 develops a thrust of 114 lbs., it will be noticed that the subsequent tests, with the exception of the third, all lie above the black line and thus show that the screw did not maintain its initial efficiency with increasing power. The conditions of the third test, however, show a marked improvement in the efficiency, which is quite conceivable if we suppose that the blade angle in the case of the first test was itself relatively inefficient. With the exception of this third test the four other points at first sight have a characteristic similar to the test of a fixed angle blade screw, but closer examination shows that at the higher power values the efficiency is not falling away from the



theoretical value as much as generally happens in such tests with fixed angle blades as have come before our notice. In other words, there is an indication of some extraneous cause at work affecting the efficiency, which must apparently be put down to the variable blade angle, although in the absence of more extensive data it is really impossible to make any logical deductions of cause and effect.

A far more important consideration is the relationship between the third test and the others. If we accept the validity of the third test it shows in an extraordinarily marked way that there is one best blade angle for a screw



The plant with which the Lorenzen variable-pitch screw was tested. On the left is an electric motor which drives the vertical shaft by a belt.

One of the very large Lorenzen variable-pitch lifting screws in course of construction.

working under certain conditions, compared with which all other blade angles are very inefficient. Thus, suppose the point in the chart representing the third test is moved to the left so that it coincides with the theoretical curve. In making this alteration, the dotted line would have to be moved bodily to the left quite a distance, and as the space between the black line and the dotted line represents inefficiency the conclusions to be drawn are obvious. As we have remarked, however, it is exceedingly difficult to make conclusive deductions from the set of figures that are scarcely more comprehensive than would be required in a preliminary sort of way for testing the experimental plant itself.

In view of the isolated nature of the third test, it is not without interest to try and check its plausible accuracy from purely theoretical considerations and it is with this end in view that we have made the deductions that have been tabulated in conjunction with the Faraday House test. The first three columns of the table show the horse-power, revolutions and thrust obtained from the test. The fourth column shows the nominal overall efficiency as represented by thrust to horse-power. It is important to bear in mind, however, that this efficiency relates to the total horse-power in the shaft. In previous articles we have already explained that a given thrust from a given diameter of screw is most efficiently obtained when the slip stream velocity is uniform over the entire disc area, and on this basis it is possible to calculate the minimum theoretical slip stream velocity corresponding to a given thrust. These values are given in the fifth column. It has also been explained in preceding articles how every slip stream velocity has an efficiency of its own in pounds-thrust to horse-power represented by the energy in the slip stream. These values are given in the sixth column while the seventh column shows the apparent power expended in the slip stream in order to produce the thrusts in the third column. The relationship of the seventh column to the first column is given in the eighth column, which shows what percentage of the shaft horse-power was at least expended in maintaining the slip stream. The remainder, which has been utilised to overcome skin friction and other losses, is stated in the ninth column.

From the second column, giving the revolutions, the tip speed of the blade has been calculated as shown in the tenth column, and in preceding articles it has already been explained that every tip speed has a certain limiting efficiency when the blade in question has an angle of least resistance, supposed to be situated ·6 of the radius from the axis of rotation. These and other values will be found on page 977 of last year's volume. Taking the third test, which is the one of especial interest in this matter, the limiting efficiency in question for the stated tip speed of 166 ft. per sec. is 65 lbs. per shaft h.p.* after allowing for 50 per cent. loss in skin friction, which is the theoretical basis of that particular argument. It is necessary to point out here that the apparent power expended in skin friction is very much less than 50 per cent. for the test in question, but as the comparison of efficiencies will be resolved on a common basis of power expended in the slip stream the difference is of no importance.

Now it is very important to bear in mind that these very high efficiencies can only be obtained, even theoretically, when the total thrust developed by the screw is very small. The limiting thrust value for the efficiency in question is 13·7 lbs.† and the corresponding power expended in the shaft is ·21-h.p. Half of the power there given is expended in the slip stream and it is therefore necessary to consider the figure ·105 as representing the power that creates the thrust of 13·7 lbs. instead of the value ·21 as given above for the shaft h.p. Similarly, of course, it is necessary to consider that the actual thrust of 198 lbs. in the third column has been developed by the slip stream power of 5·9-h.p.

* Efficiency $= \frac{21000}{v}$

† Thrust $= \frac{(\text{Pitch})^2 v^2}{5300}$ where pitch = ·052 π D and v = tip speed.

Starting with the lower value of 1·05-h.p., producing a thrust of 13·7 lbs., we can apply the two-thirds power law in order to see how much thrust the expenditure of 5·9-h.p. ought to produce and we find that the value in question is 203 lbs. Actually a thrust of 198 lbs. was obtained, consequently the third test very closely approximates to the theoretical value, as can perhaps be better appreciated by reference to the chart where the theoretical position of the third test is indicated by a circle enclosing a cross. The above comparison has been made entirely by reference to slip stream velocities and is unaffected by the question of how much of the shaft horse-power is expended on skin friction. The discrepancy between the theoretical and the actual values for the third test shows that the loss has taken place in expanding, so to speak, the limiting condition up to the practical condition without using a material screw and there is apparently no *prima facie* reason why the actual and theoretical values should not coincide at this point although it would be rather remarkable if they remained together afterwards.

The tests of the 15-ft. propeller, which have also been tabulated and somewhat enlarged upon, are of an altogether too variable nature to enable any deductions whatever to be made from them, as may be gathered from a mere glance at the first column showing the nature of the variations in power.

Summing up, therefore, we can only remark that the tests of the Lorenzen variable pitch lifting screw serve to show, as far as they show anything, that a propeller has one best blade angle compared with which every other is very inefficient indeed.

Tests of the Lorenzen Variable Pitch Lifting Screw.

1	2	3	4	5	6	7	8	9	10
h.p.	r.p.m.	T.	E.	V.	E_1.	$(h.p.)_1$.	Thrust h.p.	Friction h.p.	v.

Deductions.

Efficiency over all thrust.	Slip stream velocity calculated from thrust.	Efficiency calculated from slip stream.	Apparent power in slip stream.	Per cent. power used for thrust.	Per cent. power in skin friction.	Tip speed.

Diameter of screw 9 ft. 10 ins.

Faraday House Test—

Propeller. Shaft h.p.	r.p.m.	Thrust lbs.	Shaft h.p.	ft./secs.	lbs. h.p.	h.p.	Per cent.	Per cent.	ft./secs.
4·3	320	114	26·6	25	44	2·6	60·5	39·5	165
6·2	301	139	22·4	27·5	40	3·5	56·5	43·5	155
8·1	322	198	24·4	33	33·5	5·9	73·0	27·0	166
12·1	360	214	17·7	34·5	32	6·7	55·5	44·5	186
14·2	347	240	16·9	36·4	30	8·0	56·5	43·5	179

Diameter of screw 15 ft.

Makers' Test—									
8·8	240	210	23·9	22·3	49·5	4·25	48·2	51·8	189
9·7	245	226	23·3	23·2	47·5	4·75	49·0	51·0	192
10·2	236	236	23·2	23·6	46·5	5·07	49·7	50·3	185
8·6	222	234	27·2	23·6	46·5	5·03	58·5	41·5	184
9·0	222	236	26·2	23·6	46·5	5·07	56·4	43·6	185

Notes and formulæ:—Col. 5, V ft./sec. $= \frac{\sqrt{535 \text{ thrust}}}{\text{diameter}}$; Col. 6, $E_1 = \frac{1100}{V}$; Col. 7, $(\text{h.p.}) = \frac{\text{thrust}}{E_1}$; Col. 8, power in slip stream ÷ shaft h.p.; Col. 9, 100 − per cent. power in slip stream; Col. 10, v. = (πD) × revs. per sec.

⊛ ⊛ ⊛ ⊛

AMERICAN PASSENGER RECORD.

ACCOMPANIED by Lieut. Foulois, Parmalee, on his Wright flyer, made a long reconnoitring flight along the Mexican frontier on the 5th inst. He was in the air for 2 hrs. 7 mins., during which time a distance of about 116 miles was covered, the average height being about 1,000 metres.

It is stated that the aeroplane was in constant communication by means of wireless telegraphy with the military headquarters and Lieut. Foulois carried a carbine for purpose of defence in case of need. This machine and Mr. Harkness' Antoinette are doing useful work for the U.S. troops.

PROBLEMS RELATING TO AIRCRAFT.*

By MERVYN O'GORMAN.

1. THE aeroplane and the dirigible balloon being devices for obtaining free movement over and past terrestrial obstructions, and each having its advantages, it is useful to consider them from the point of view of the result to be achieved, and not on the score of sensationalism—the one because it is unexpected, and the other because it is bulky. Neither can be described as a generally preferable way of obtaining the objects of flight, each is superior in attaining certain specific results.

2. Thus an aeroplane would be additionally desirable if it could rise out of stubble, out of a wood, or even out of a ploughed field or a street, or descend at a slow speed independently of its horizontal velocity and of the movement of its propellers; if it could hover over one spot at will without noise; if its stability were unaffected by wind puffs; if it could ascend vertically at the rate of 9 or 10 ft. per sec., and if it could when on the ground in a gale, collapse into negligible volume and portable form. Moreover, it would have an advantage if it did not necessarily come down when its motive power fails, &c., &c. In other words, an aeroplane with the good qualities of a dirigible balloon and none of its defects would be obviously desirable.

3. Reciprocally, the desirable airship should resemble an aeroplane in many things. It should be capable of being brought out of dock by few men. It must not leak hydrogen and want frequent refilling; it must run at 40 to 50 miles an hour; it would be convenient if it did not become more buoyant with a hot sun upon it; it must be capable of being anchored in the open without being folded up, at least in the lighter winds, and it must be reduced largely in bulk. Briefly, the dirigible balloon requires in addition to its own points, a share of the good qualities of an aeroplane without acquiring fresh limitations and dangers.

4. The two studies accordingly converge. Moreover, they have this in common, that they both depend for their eventual success upon a widespread increase in the study of meterological phenomena, including the charting of winds, vertical as well as horizontal, and some means of foretelling the amount of pulsation of wind to be expected.

5. **Air Movements.**—It is the air movements which set us the problems with which this Paper is concerned, and there are two aspects from which they may be considered—the rules of general movements and air gusts.

6. The rules of general movements—such as will be useful in assisting a pilot in making a course—were never better given than in Mr. Dines' Paper to the Aeronautical Society (see the "Aeronautical Journal" for January, 1911, p. 8):—

"Almost every wind that blows at an island station will be found to be stronger at a few hundred feet above the surface. As a general rule it will be found that if you face the surface wind, the wind above will come somewhat from your right hand. Suppose a balloon is at a height of 2,000 ft., an east wind is not likely to increase much in strength above this height, but a south-west or west wind is likely to do so. A south-east wind on the surface is fairly certain to turn to a south and then to a south-west wind at a moderate elevation, and a north wind may draw into a north-west, but it is not so likely to do so. As a rule for winds other than north, a change of two points of the compass in direction, and a doubling of the velocity may be expected between the surface and 3,000 ft., excepting during a hot sunny day in spring and summer. On such days a general mixing of the air by convection currents tends to equalise the different strata, and the velocity at the surface will not be greatly less than above. At night calm mostly prevails in the lower strata if the sky be clear, and this is particularly the case on frosty nights, and even days too, in winter. But there is no rule hardly without an exception, and I have met with exceptions to all the above rules."

7. **Air Gusts.**—It is well to remark that the airman of to-day not only wants these data about wind direction, but in addition asks questions which are couched in language which would have been curious to the meteorologist of four years ago. He may ask what there is in connection with the air above the shelving undulations of Salisbury Plain which makes it so treacherous on still sunny days—the very days when he is tempted out—whilst it is safe at Laffan's Plain and Eastchurch. I do not think the data exist from which an answer which is wholly satisfactory may be supplied.

8. We know that dry air is on the one hand transparent to, and is practically unwarmed by, the sun's direct rays, and that these rays fall on the patches of coloured and shaded surface of the ground, and that on the other hand the damper air near the ground is warmed by the ground and by dark heat rays, so that columns of air ascend over the sunlit patches. These and the corresponding descending streams cause a very great amount of disturbance to the altitude of balloons. Are these columns sufficiently swift and local to explain this class o 3trouble with aeroplanes, or are we here confronted with a complex example of air thrown upwards by the ground undulations owing to the distortion of some unperceived lighter winds? It is fortunate that Hendon, Eastchurch and Laffan's Plain are free from these troubles, and we must suppose that the form of the undulations has something to do with it, since they aggravate the patchiness of the hoar frost, the damp and the ground temperature.

Recording Theodolites.—Mr. Dines' recording theodolite, which writes down both the altitude and the azimuth of a pilot balloon, also seems to be well adapted to the exploration of such danger spots and for finding us a somewhat more scientific explanation than the suggestion underlying the popular term a "hole in the wind." It is to be noted, however, that all model balloon observations are in a measure vitiated as regards vertical movements by the change in buoyancy of the balloon, due to barometer and temperature changes during the experiment.

9. **Relief Maps.**—A map in relief, submerged in water, might be used to show the disturbance of streams of pigmented fluid when a flow is established over the model from various points of the compass, after the method of Dr. Hele-Shaw, but there are grave difficulties apart from the incompleteness involved in neglecting the temperature question.

Wireless Telegraphy.—Recently a new research instrument has been enlisted, namely, wireless telegraphy. Broad lines of news as to the weather which is coming to us across the sea can and do reach us now by wireless, and this when fully organised will make a great difference to airmen, since in England our weather is mostly sea-borne.

10. **Gusty Winds and Aeroplanes.**—The cardinal matter for aeroplanes is the gustiness of the wind.

Experiments show that the following effects must be anticipated:—

(*a*) Wind fluctuates in speed, so that a wind of, say, 20 m.p.h. average can be the outcome of puffs varying from 15 to 25 m.p.h. Similarly, a 30 mile average can be due to fluctuations from 22½ to 37½ m.p.h.

(*b*) The time between such fluctuations may be so short that there are 17 puffs to the minute—say 1 in 4 secs.

(*c*) The alteration is not one of speed only, but also of direction at similar, but not the same, intervals of time.

(*d*) The variations in speed do *not* coincide with the changes of direction as far as can be seen to-day.

(*e*) The changes are *not* necessarily the same over large areas, but may be so different at two testing stations 8 yds. apart, that the speed at one is double that at the other. (Dines.)

(*f*) The gustiness at a height differs from that near the ground, but the maxima of speed are nearly the same in each case, so that the average velocity at a height is greater—that is, it comes nearer to the maxmium.

These conclusions are of course not of general application, and they may, indeed, be partially erroneous, but they are what I have gathered from various sources—notably from M. W. H. Dines' admirable lecture cited above.

It is the effect of these on aeroplane stability that we must consider, and to do this it is useful to sub-divide the many existing types of aeroplanes, so as to get them into some more intelligible and more significant classification than "biplane" and "monoplane" (see para. 12).

11. **Air Movements and Airships.**—The airship loses pace from point to point by the interference of gusts, and when out of sight of land its pilot loses his clear sense of the direction he is following, but he does not lose his balance in the same serious way as with an aeroplane. His power of alighting, dependent in a measure on his stock of ballast, is greatly affected by the loss alternately of gas, and of ballast

* A paper read before the Incorporated Institution of Automobile Engineers, on March 8th, 1911.

due to up and down movements; above all the possibility of anchoring in the open depends on the designer's ability to outwit in some way the gusts which may make the airship bounce about on its anchor ropes in the most alarming manner.

12. **Aeroplanes and Stability.** — There is a certain similarity in the devices used at present by most makers to get some degree of lateral stability when flying, turning and gliding, but there is apparently greater diversity in their ideas as to longitudinal stability, and the best position of propellers. These two features therefore are used as a basis for a suggestion for a classification—although I admit that there ought to be as many classes as there are designers; these, however, would be useless for memorising, and accordingly I suggest that we take three.

1. Class S.—Those of which the main wings are preceded by a small plane which is more intensely loaded and succeeded by the propeller (Fig. 1).

2. Class B.—Those of which the main wings are preceded by the propeller and followed by a smaller plane (or planes), which is more lightly loaded, if at all (Fig. 2).

3. Class F.—Those which have the main wings followed by a smaller plane more lightly loaded, if at all, as in 2, but the propellers of which are placed between the main wings and the tail plane (Fig. 3).

Those familiar with the machines of to-day will include in Class S the latest Voisin, Valkyrie, Cody, Clarke and Santos Dumont very early machines, &c.; in Class B the Antoinette, R.E.P., Blériot and Avro, &c.; in Class F the Voisin, Farman, British and Colonial, &c.

13. **The Vee between Planes.**—No fundamental importance need be attached to the classification, but all attention must be given to the method adopted in each case to secure fore and aft stability, which is throughout by some attempt to get a Vee between the surfaces back and front.

Since a plane carries weight by throwing air downwards, its general slope must be with the trailing edge downwards, and the more heavily it is loaded per square foot, the more steeply must it slope downwards to get the adequate reaction for any one speed of travel. Accordingly, as the forward and back planes of one and the same machine must move at the same speed, it is not possible to get the desirable Vee or inclination between them without loading one more intensely than the other. Not only so, but the front plane of the two, whether it be larger or smaller, must always be the more heavily loaded if the Vee is to have its opening to face skywards. Any more lightly loaded auxiliary plane, such as is placed in front of the carrier planes or wings, diminishes the longitudinal stability of the combination by giving rise to an inverted Vee. This is instanced by the front elevator planes of the Farman—the effect of which has to be counteracted by increasing the size of the tail planes. (See Fig. 16.)

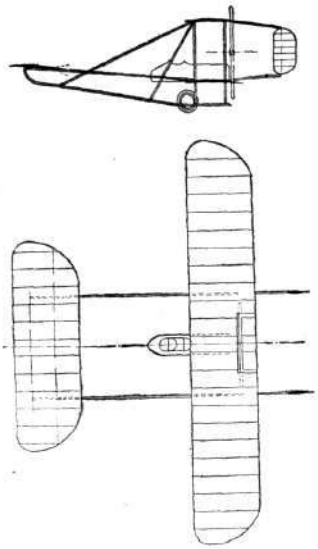


Fig. 1.—**Class S.** The class letter is chosen after the name of M. Santos-Dumont.

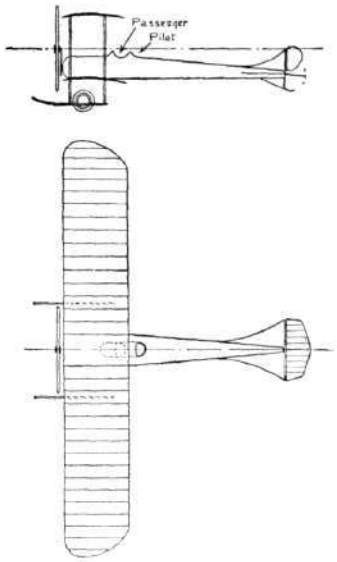


Fig. 2.—**Class B.** The class letter is chosen after the name of M. Blériot.

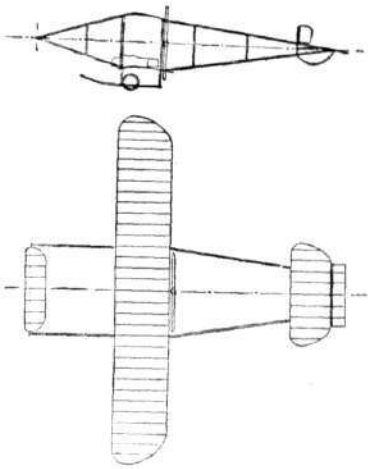
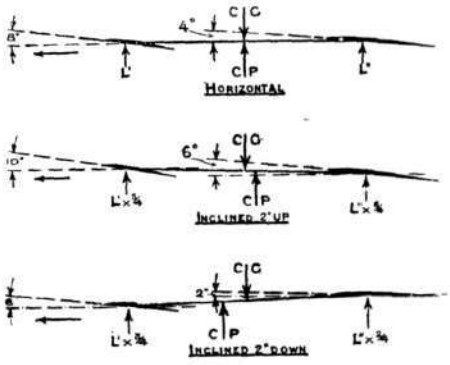


Fig. 3.—**Class F.** The class letter is chosen after the name of Mr. Farman.

14. Machines Veed fore and aft, that is, those having the front plane set at a greater angle of incidence than the back plane, are, to some extent at least, stable in the fore and aft direction. This is shown graphically on the accompanying diagram Fig. 4, kindly arranged for me by Mr. F. Green, together with Figs. 16 and 17.



FORE & AFT STABILITY.

Fig. 4.

In the upper case Fig. 4 it is assumed that the front plane is half the size of the back plane, but that it is set at an angle of incidence of 8° against an angle of 4° for the back plane. For small angles the lift is proportional to the angle, and

consequently the front plane, being at double the angle of the back plane, will lift twice as much per square foot. The centre of pressure when the aeroplane is horizontal will consequently lie half-way between the centres of pressure of the two planes, and the centre of gravity must therefore be adjusted to fall at the same point.

In the centre diagram the aeroplane is imagined to be tilted up at an angle of two degrees, and consequently the front plane will make an angle of incidence of 10°, and the back plane one of 6°, that is to say, the front plane will have increased its lift by a proportion of ten to eight, that is of five to four, while the back plane will have increased its lift in the proportion of six to four. The centre of pressure has consequently travelled back, and will now be behind the centre of gravity, and thus a righting couple will be applied, which will tend to move the aeroplane back to its horizontal position.

In the third case the aeroplane is imagined to be inclined downwards at an angle of 2°. In this case the lifts of the two planes will be respectively three quarters and two quarters of their original lift, consequently the centre of pressure will have moved forward, still giving a righting couple. It must be noted that the angles chosen here are arbitrarily selected because they are easy to handle. In practice the angles are more like 9° and 13°.

It can readily be seen that if the front plane is at a lesser angle of incidence than the back plane, the reverse effect will take place.

Like all other much-discussed and popular machines, aeroplane design is to some extent governed by fashion. The inherent instability of the early Wright machines seems to have led to the conclusion that no machine without a tail could possibly be stable.

Recently, however, this has been disproved by the Valkyrie and the new Voisin aeroplanes, and it is probable that in the future more attention will be devoted by designers to this type.

15. If experience up to the present had shown definitely any superiority in one of the classes over the others, it is not improbable that this division would not have been made owing to the extinction of the inferior classes. A few salient facts resulting from each combination with the propeller position may be noted, remembering that wherever a plane is on the suction side of the propeller, *i.e.*, in front of it, the operation of the engine does not make much difference to the amount of air thrown down by that plane, that is, its lift is but little affected by the engine stopping.

(To be continued.)

CORRESPONDENCE.

*** *The name and address of the writer (not necessarily for publication)* MUST *in all cases accompany letters intended for insertion, or containing queries.*

Correspondents communicating with regard to letters which they have read in FLIGHT, would much facilitate ready reference by quoting the number of each such letter.

NOTE.—*Owing to the great mass of valuable and interesting correspondence which we receive, immediate publication is impossible, but each letter will appear practically in sequence and at the earliest possible moment.*

Longitudinal Stability.

[1099] While in Paris, quite recently, I had the opportunity to hear a well-known authority regarding aeroplane matters, and the following is a short *résumé* of his speech :—

The too near approach by the elevator to a vertical position during descent is one of the most common causes of aeroplane accidents. The longitudinal stability of an aeroplane depends on the dihedral angle between the equivalent surface of the main supporting planes and that of the tail planes. When this angle opens upward, the aeroplane has automatic longitudinal stability. A disturbing element, however, is introduced by a third surface, that of the elevator, which forms with the supporting planes an angle which may open either upward or downward, according to the position of the elevator. In ascending, this angle is open upward, and the tendency is to increase the longitudinal stability. But when the elevator is reversed for the descent, the angle flattens out to a straight-line position and then becomes downwardly open, like an inverted V, thus causing an upsetting action. This lessens the stability caused by the upwardly open angle between the main planes and the tail, and at a certain critical point will entirely neutralise it, the result being that when this point is passed, the machine will suddenly and unpreventably assume a vertical position and drop headlong to the ground.

On the other hand, M. Louis Blériot contends that the greatest danger does not lie in the descent in a nearly vertical spiral drop, but that the critical point is reached when the airman must change from an abrupt angle to one more nearly horizontal in order to strike the ground at a tangent, as in the fatal accident to Chavez, who was killed when preparing to alight after his successful trip over the Alps.

RENE OZOUF.

Centrifugal Force.

[1100] I should be glad if you would express in formulæ the two following queries :—

1. The total centrifugal force acting at right angles to a diameter of a homogeneous disc of diameter D ft., weight W lbs., and uniform thickness t inches, N revs. per min., or V ft. per. sec. rim velocity.

2. At what velocity in ft. per sec. (V) or revs. per min. (N) the disc would burst, given the maximum tensile stress as f lbs. per sq. in.

With reference to Stringfellow's aeroplane, I believe a model of this is suspended in one of the rooms at South Kensington Museum, together with the engine and an old print of the machine in flight, as designed for passenger carrying.

Balham. F. W. ALLSOP.

[See "Flight Manual," F 39, Fly-wheel Stress.

$P = \cdot 375 wv^2$.

P = bursting stress (lbs./sq. in.).

w = weight of material (lbs./cu. in.).

v = velocity of circle of gyration (ft./sec.).

$\therefore$ limiting speed $v = \sqrt{\frac{P}{\cdot 375 w}}$,

in which P becomes the maximum tensile stress.—ED.

The Cody Control.

[1101] On the Cody biplane would it not be possible to work the right elevator and balancer with the left foot and *vice versa?* To elevate, press down both feet; to go down, remove the pressure. If this was done, a left-hand steering-lever with a sort of Bowden brake handle for the switch could do the rest of the control and leave the right hand free for feeding purposes. I should be pleased to hear what others think of this.

Southsea. "SEALARK."

[Mr. Cody does not use both hands unless he wishes to do so, even with his present control.—ED.]

The Neale Control.

[1102] Your most interesting FLIGHT brings to my notice the claims of Mr. Neale (and later that of Mr. Ditchfield) in connection with the "screen rudders" and the principle that brought about Mr. Neale's interconnection of the two elevators on his flying machines. So I must beg you to favour me by making it public knowledge (by means of FLIGHT) that, by legal documents, I can prove my priority on such inventions as the "screen rudders," with its theoretical principle, not excluding the theoretical principle underlying the interconnection of the elevators with the very arrangement for their manœuvre. Mr. Neale would have found this out before now had he made his application for patent in the U.S.A.

I may also state that I have made much better and extensive use of such scientific principles, but I regret being unable as yet to give you and your readers full particulars about my invention for I fear that—if I well understood my patent attorney—it would deprive me of the rights to foreign

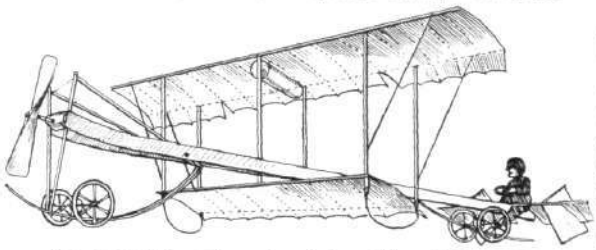
patents (to which I aspire) should I not within twelve months from publication be prepared to make application for such.

Sydney. N.S.W. JOSEPH MACINANTE,

See-Saw Type Aeroplane.

[1103] I enclose a sketch of the see-saw type of aeroplane that I have invented and for which I claim that it is easier to learn to fly than any other type. The pilot has the whole of the machine in front of him with direct control and "feel" of both elevating and steering handle, which is of gun-metal and similar to the cycle handlebar in use for steering, but with up and down movement for balancing.

Primarily, the invention is to secure a better sense of direction in beam winds. The present loading of aeroplanes



is a central disposition of carried weights, which in a beam wind acts as a pivot for the aeroplane to veer round.

Features not to be lost sight of are:—the compass is a long way from the engine, so is the pilot, and the provision of a hoe shoe or grapnel will be useful to hold back aeroplane whilst starting engine and as an emergency drag in finishing a flight.

The idea is the outcome of another original machine I have designed, built and flown with an Alvaston engine.

JOHN GAUNT.

Aeroplane Design.

[1104] I would be obliged if you would enlighten me how it is that most aeroplanes have straight entering edges, and some with tapered trailing edges; and the shape is said to be efficient; yet propellers, which are a form of aeroplane, have proved themselves to be most efficient with curved entering edges and straight trailing edges. Which is the most efficient theoretically, and why?

Also, what is the theoretical advantage of increasing the angle of incidence of a plane, *of an aeroplane*, near the body, as the whole plane flies at one speed; and is there any theoretical advantage of having a negative angle of incidence at the wing tips?

Old Trafford. C. R. T.

[Constructional considerations largely affect the points raised in the above letter. There is no authentic data on the relative values of a straight and curved entering edge.

There is no theoretical advantage in increasing the angle of incidence of an aeroplane but there might be some advantage in doing so in order to increase the lift without seriously affecting the construction.

Presumably your last query refers to the Dunne machine, and for that we would refer our correspondent to a description of the Dunne aeroplane which appears in FLIGHT, June 18th and 25th, 1910.—ED.]

Goupy Biplane.

[1105] Will you give me a clear, concise explanation as to why the Goupy biplane makers place the upper planes slightly further forward than the lower one?

N. Kelvinside. L. ILLINGSWORTH.

[If one cambered plane is placed above another of the same camber, the gap is not uniform between the leading edge and trailing edge, as may be seen by striking two circular arcs from different centres. It will be observed that the entry and discharge are constricted as compared with the centre portion. If, however, one arc is placed further forward than the other, the passage through the gap is more nearly parallel. We believe that this principle underlay the original conception of the Goupy biplane, although, as a matter of fact, the restriction in question does not mean very much, and certainly the original Goupy biplane had very slightly cambered planes.—ED.]

MODELS.

Notice to Correspondents.

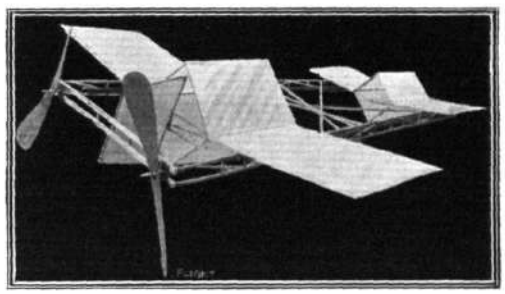
THE correspondence on the subject of models having attained to such dimensions that it is impossible to devote adequate space to enable the letters to be published sufficiently soon after their receipt, the Editor requests correspondents to make their letters as brief as possible and to write on one side only of each sheet of paper.

Sketches should be drawn on a separate sheet, which should bear the sender's name and address. The name and address should also be written on the back of all photographs.

The "Redivalls Monoplane" Principle.

[1106] I have pleasure in enclosing you photograph of the self-righting monoplane which I have invented and provisionally protected (July and August, 1910), and which was awarded Manchester Aero Club's special certificate at their November model exhibition.

Since witnessing Paulhan's successful arrival at Manchester from London early last year I have taken great interest in the progress of aviation, and have made several models of above design. The model photographed was only five days in the making. It flew successfully immediately. I claim to have discovered the secret of the bird's *natural* lateral stability, and to have applied it to my invention. It is a very simple secret. If upset by the wind a bird merely throws out its wings rigidly at a dihedral angle to its body. As it falls the air meets with the *resistance* of the bird's *body* as it passes the wing. As the wings are at a dihedral angle the said air meets the resistance of the *upper* part of the body *first*, and naturally turns the body over slightly, thereby commencing the return to the horizontal of the wings. As the bird still falls, the *lower* part of the bird's body divides the air it displaces on to the wings, thereby completing the return to the horizontal or lateral balance. I guarantee that I can hold my model at a *vertical* angle to the ground, and that it will fall and immediately commence to assume the horizontal, and complete same in only *double* its breadth. If thrown as a glider it will regain the horizontal in its own breadth of a fall. It will fly splendidly, and if flown at a vertical angle it immediately



commences to assume the horizontal (or lateral balance), and completes it in a few feet, and continues its flight perfectly laterally balanced. No help is required either of weight or of mechanical means. None is received by the model. The elastic is placed *immediately* below the planes. It even regains the horizontal without the weight of it.

Perhaps a few particulars will be acceptable to your readers.

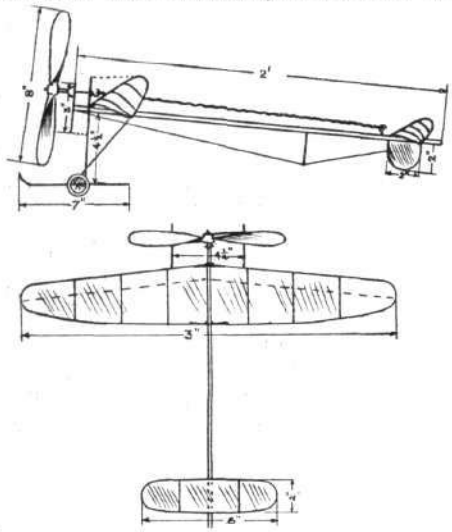
Length of fuselage 30 ins., main plane 30 ins. by 7½ ins., small plane 15 ins. by 5½ ins. The two propellers are 11½ ins. each in length, and are propelled by two lengths of $\frac{1}{16}$-in. elastic of 20 strands each. The fuselage is scientifically strengthened by small wooden pillars and cross-pieces. The wood used is $\frac{1}{8}$-in. whitewood, except the front and rear cross-pieces, which are $\frac{1}{4}$-in. whitewood. The planes are slightly cambered, and covered with special aero silk. It flies small plane forward. There is no chassis; none is required, as it invariably falls level. In my provisional applications the planes are shaped as in the Dunne aeroplane (except that they are divided by the diamond in the centre). I may say that I had not seen any illustrations of the Dunne aeroplane, or even heard of it prior to my invention. My idea in having the ends of the planes to the rear of their centre was that it would help longitudinal stability. In my haste to have my model ready for the model exhibition I inadvertently cut my silk in an oblong shape. As I had no other, and it was too late to obtain any, I altered my planes to fit them; hence the reason why my planes are practically straight across. The dihedral angle of the planes is noticed by the

uncovered portions of the woodwork continued to the centre of the two diamonds. The two straight pieces noticed across the diamond of the main plane are to strengthen the fu-elage. I claim that the diamond strengthens the planes; wires can be fastened thereto for a full-sized 'plane. The diamond also helps to sustain the monoplane in the air as the air rushes through. I am willing and would be very pleased to give a demonstration with my model upon appointment with any *bonâ fide* aviation firm.

Eccles. "REDIVALLS."

Model Monoplane.

[1107] Enclosed you will find a rough working drawing of a monoplane of my own design, which I have just completed. The cost was only 9*d.*, as I had most of the materials at hand at the time I started (they being left over when I



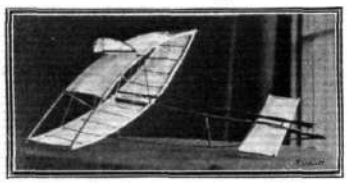
made another model a few weeks ago). The wood used was American bentwood, which I obtained from H. Fentum Phillips and Co., which cost 6*d.* (24 ft., $\frac{5}{16}$ in. by $\frac{3}{16}$ in.).

Hoping this may be of some use to your readers and thanking you for the useful information in FLIGHT (from which I have got most of my knowledge of models, &c.).

Brockley. F. G. PETER.

The Baxter Model.

[1108] In a back number of FLIGHT (Vol. II. No. 50) appears a letter No. 948, in which Mr. Baxter gives measurements of a miniature model. Perhaps you will allow me to ask him at this late date to kindly let me know through



your columns some further particulars of the construction. Possibly he would be good enough to publish working drawings and state the materials used for the different parts.

I enclose a small model of my own design and construction that has proved a fairly successful flyer. It is made of bent fretwood and the planes are covered with grease-proofed paper.

Macclesfield. C. C. HORNER.

Model Construction.

[1109] May I ask some of your readers to help me with their advice as to how I should best bend the ribs of a monoplane having a chord of 20 ins. and a span of 6 ft.

Geelong, Victoria, Australia. H. R. COCKS.

PUBLICATIONS RECEIVED.

Birdflight as the Basis of Aviation. By Otto Lilienthal. Translated by A. W. Isenthal. London: Longmans, Green, and Co. Price 9*s.* net.

American Amateur Aviation. The Elbridge Engine Co., Rochester, N.Y., U.S.A.

Catalogue.

The Bowden Album of Patent Wire Mechanism. Bowden Wire, Ltd., 37–41, Pratt Street, Camden Town, N.W.

Aeronautical Patents Published.

Applied for in 1910.

Published March 9th, 1911.

3,652. H. J. HOWARD. Two-stroke I.C. aerial engine.
3,688. C. D. O. VOLLMANN. Aerial machines.
3,778. O. CADEL. Aeroplanes.
4,560. J. E. GEE. Aeronautical propellers.
4,708. W. H. NORTHCOTT. Airships.
7,289. H. C. BARBER. Monoplanes.
8,290. R. POHL. Propellers for airships.
12,306. H. L., A. E., AND H. O. SHORT. Aeroplanes.
17,776. A. A PENTEADO. Aeroplanes.
19,427. H. A. AND H. SANDERS. Aeroplanes.
29,652. O. CADEL. Aeroplanes.
29,653. O. CADEL. Air-current indicators.

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British General Events.

Mar. 24–April 1 Olympia Aero Show.
June 28 .. Gordon-Bennett Aviation Cup Contest.
July 22 .. *Daily Mail* Round England Contest.
Oct. 31 .. Close of British Michelin Cup.

Foreign Fixtures.

April 9–21 .. German Circuit—Ulm, Frankfort, Friburg, Strasburg, Carlsruhe, Mannheim, Wiesbaden (1016).
April 16 .. Dresden Meeting.
April 27–May 16 German National Circuit—Aix-la-Chapelle, Cologne, Essen, Bielefeld, Brunswick, Berlin (975).
May .. Paris—Bordeaux—Paris.
June 4–30 .. European Circuit—Paris, Berlin, Brussels, London, Paris.
June 4–12 .. Johannisthal National Meeting.
June 6–11 .. Rome Circuit.
June 12–18 Rome-Turin race.

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